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A SYNOPSIS OF THE NORTH AMERICAN LEPIDOSTOMATIDAE (TRICHOPTERA)

by

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CONTENTS

ABSTRACT 1

INTRODUCTION 1

ACKNOWLEDGMENTS 3

LEPIDOSTOMATIDAE ULMER 3

- Egg and Oviposition 4
- Larva 4
- Pupa 5
- Case 5
- Adult 6
- Male Genitalia 8
- Female Genitalia 9
- Keys to North American Lepidostomatidae Genera 10
  - Larva 10
  - Adult 10
- *Theliopsyche* Banks 10
  - Key to Adults of *Theliopsyche* Species 11
    - *Theliopsyche corona* Ross 12
    - *Theliopsyche epilonis* Ross 12
    - *Theliopsyche grisea* (Hagen) 13
    - *Theliopsyche melas* Edwards 14
    - *Theliopsyche parva* Banks 14
    - *Theliopsyche tallapoosa* Harris 15
- *Lepidostoma* Rambur 15
  - Key to Larvae of *Lepidostoma* Species or Species Groups 16
  - Key to Adults of *Lepidostoma* Subgenera 18
- *Lepidostoma* Subgenus *Nosopus* McLachlan 19
  - Key to Adults of *L. (Nosopus)* Species 20
  - *Lepidostoma (Nosopus) Reosum* Group 24
    - *L. (Nosopus) reosum* Denning 24
  - *Lepidostoma (Nosopus) Astaneum* Group 25
    - *Lepidostoma (Nosopus) astaneum* Denning 25
      - *Lepidostoma (Nosopus) goedeni* Denning (n. syn.) 25
    - *Lepidostoma (Nosopus) recinum* Denning 26
      - *Lepidostoma (Nosopus) calense* Denning (n. syn.) 26
  - *Lepidostoma (Nosopus) Jewetti* Group 26
    - *Lepidostoma (Nosopus) jewetti* Ross 27
    - *Lepidostoma (Nosopus) licolum* Denning 27
  - *Lepidostoma (Nosopus) Americanum* Group 28
    - *Lepidostoma (Nosopus) americanum* (Banks) 28
    - *Lepidostoma (Nosopus) bryanti* (Banks) 29
      - *Lepidostoma wisconsinense* Vorhies (syn.) 29
    - *Lepidostoma (Nosopus) costale* (Banks) 30
    - *Lepidostoma (Nosopus) prominens* (Banks) 31
  - *Lepidostoma (Nosopus) Podagrum* Group 31
    - *Lepidostoma (Nosopus) podagrum* (McLachlan) 31
    - *Lepidostoma (Nosopus) quercinum* Ross 33
  - *Lepidostoma (Nosopus) Roafi* Group 33
    - *Lepidostoma (Nosopus) roafi* (Milne) 34

Lepidostoma (Nosopus) Modestum Group 35
  Lepidostoma (Nosopus) compressum Etnier & Way 36
  Lepidostoma (Nosopus) lydia Ross 36
  Lepidostoma (Nosopus) modestum (Banks) 37
  Lepidostoma (Nosopus) ontario Ross 37
  Lepidostoma (Nosopus) pictile (Banks) 38
    Lepidostoma swannanoa Ross, n. syn. 38
  Lepidostoma (Nosopus) weaveri Harris 39
Lepidostoma (Nosopus) Unicolor Group 40
  Lepidostoma (Nosopus) bakeri Flint 40
  Lepidostoma (Nosopus) cinereum (Banks) 41
    Lepidostoma strophe Ross, n. syn. 41
  Lepidostoma (Nosopus) frosti (Milne) 43
  Lepidostoma (Nosopus) knulli Ross 44
    Lepidostoma leechi Denning (syn.) 44
  Lepidostoma (Nosopus) unicolor (Banks) 44
Lepidostoma (Nosopus) Mexicanum Group 46
  Lepidostoma (Nosopus) acarolum Denning 47
  Lepidostoma (Nosopus) aztecum Flint & Bueno 47
  Lepidostoma (Nosopus) dafila Bueno & Contreras 48
  Lepidostoma (Nosopus) delongi Ross 48
  Lepidostoma (Nosopus) denningi Weaver n. sp. 49
  Lepidostoma (Nosopus) frontale (Banks) 49
  Lepidostoma (Nosopus) heveli Flint & Bueno 49
  Lepidostoma (Nosopus) lacinatum Flint 50
  Lepidostoma (Nosopus) leonilae Bueno & Contreras 50
  Lepidostoma (Nosopus) mexicanum (Banks) 51
    Atomyiodes bispinosa Ulmer (syn.) 51
    Lepidostoma alexanderi Denning (syn.) 51
  Lepidostoma (Nosopus) oaxacense Bueno & Contreras 52
  Lepidostoma (Nosopus) quila Bueno & Padilla 52
  Lepidostoma (Nosopus) rectangulare Flint 53
  Lepidostoma (Nosopus) reimoseri Flint & Bueno 53
  Lepidostoma (Nosopus) steinhauseri Flint & Bueno 53
  Lepidostoma (Nosopus) talamancense Flint & Bueno 54
Lepidostoma (Nosopus) Hoodi Group 54
  Lepidostoma (Nosopus) ermanae Weaver n. sp. 55
  Lepidostoma (Nosopus) hoodi Ross 56
  Lepidostoma (Nosopus) spicatum Denning 56
    Lepidostoma roemhildi Denning, n. syn. 56
Lepidostoma (Nosopus), Incertae Sedis 57
  Lepidostoma (Nosopus) cascadense (Milne) 57
    Lepidostoma plecum Ross (syn.) 57
    Lepidostoma mirum Denning, n. syn. 57
  Lepidostoma (Nosopus) verodum Ross 59
  Lepidostoma (Nosopus) deceptivum (Banks), *nomen dubium* 60
Lepidostoma Subgenus *Mormomyia* Banks 60
  Key to Adults of *L. (Mormomyia)* Species 61
  Lepidostoma (Mormomyia) Griseum Group 63
    Lepidostoma (Mormomyia) griseum (Banks) 63
    Lepidostoma (Mormomyia) morsei Weaver n. sp. 64
  Lepidostoma (Mormomyia) Serratum Group 65
    Lepidostoma (Mormomyia) carrolli Flint 65
    Lepidostoma (Mormomyia) serratum Flint & Wiggins 66
    Lepidostoma (Mormomyia) etnieri Weaver n. sp. 67

Lepidostoma (Mormomyia) Libum Group 67
  Lepidostoma (Mormomyia) excavatum Flint & Wiggins 67
  Lepidostoma (Mormomyia) libum Ross 68
  Lepidostoma (Mormomyia) sommermanae Ross 69
Lepidostoma (Mormomyia) Vernale Group 70
  Lepidostoma (Mormomyia) flinti Wallace & Sherberger 70
  Lepidostoma (Mormomyia) glenni Wallace & Sherberger 71
  Lepidostoma (Mormomyia) sackeni (Banks) 71
  Lepidostoma (Mormomyia) vernale (Banks) 72
Lepidostoma (Mormomyia) Mitchelli Group 73
  Lepidostoma (Mormomyia) lobatum Wallace & Sherberger 73
  Lepidostoma (Mormomyia) mitchelli Flint & Wiggins 74
  Lepidostoma (Mormomyia) styliferum Flint & Wiggins 74
Lepidostoma subgenus *Neodinarthrum* Weaver n. subgen. 75
Key to Adults of *L. (Neodinarthrum)* Species 76
Lepidostoma (Neodinarthrum) Canthum Group 76
  Lepidostoma (Neodinarthrum) baxea Denning 77
  Lepidostoma (Neodinarthrum) canthum Ross 77
Lepidostoma (Neodinarthrum) Pluviale Group 78
  Lepidostoma (Neodinarthrum) apornum Denning 79
  Lepidostoma (Neodinarthrum) errigenum Denning 79
  Lepidostoma (Neodinarthrum) lotor Ross 80
  Lepidostoma (Neodinarthrum) ormeum Ross 80
    Lepidostoma querlum Denning, n. syn. 80
    Lepidostoma monekum Denning, n. syn. 80
  Lepidostoma (Neodinarthrum) pluviale (Milne) 81
    Lepidostoma rhino Ross, n. syn. 81
    Lepidostoma veledum Denning, n. syn. 81
  Lepidostoma (Neodinarthrum) rayneri Ross 83
    Lepidostoma cryptum Denning, n. syn. 83
    Lepidostoma fischeri Denning, n. syn. 83
Lepidostoma Subgenus *Lepidostoma* Rambur 84
Key to Adults of Nearctic *Lepidostoma (L.)* Species 85
  Lepidostoma (Lepidostoma) carolina (Banks) 85
  Lepidostoma (Lepidostoma) latipenne (Banks) 86
  Lepidostoma (Lepidostoma) stigma Banks 88
    Lepidostoma knowltoni Ross, n. syn. 88
  Lepidostoma (Lepidostoma) tibiale (Carpenter) 89
    Lepidostoma rileyi Denning (syn.) 89
  Lepidostoma (Lepidostoma) togatum (Hagen) 90
    Silo pallidus Banks (syn.) 90
    Pristosilo canadensis Banks (syn.) 90

LITERATURE CITED 91

LIST OF FIGURES 102

FIGURES 107

INDEX 138

A SYNOPSIS OF THE NORTH AMERICAN LEPIDOSTOMATIDAE (TRICHOPTERA)[1,2]

by

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ABSTRACT

A synopsis of the North American Lepidostomatidae (79 spp.) is provided, including *Theliopsyche* (6 spp.) and *Lepidostoma* (73 spp.). The genus *Lepidostoma* is divided into 4 subgenera: *Nosopus* (45 spp.), *Mormomyia* (15 spp.), *Neodinarthrum*, n. subgen. (8 spp.), and *Lepidostoma* (5 North American spp.). In the genus *Lepidostoma* 4 new species are described, *denningi*, *ermanae*, *morsei*, and *etnieri*; and 13 new junior synonyms are recognized, *goedeni* Denning of *astaneum* Denning, *calense* Denning of *recinum* Denning, *swannanoa* Ross of *pictile* (Banks), *strophe* Ross of *cinereum* (Banks), *roemhildi* Denning of *spicatum* Denning, *mirum* Denning of *cascadense* (Milne), *querlum* Denning and *monekum* Denning of *ormeum* Ross, *rhino* Ross and *veledum* Denning of *pluviale* (Milne), *cryptum* Denning and *fischeri* Denning of *rayneri* Ross, and *knowltoni* Ross of *stigma* Banks. Three species previously known only from female types are herein associated with males: *pictile* previously considered a junior synonym of *americanum* (Banks) is a senior synonym of *swannanoa*, and *cinereum* and *stigma* are senior synonyms of *strophe* and *knowltoni*, respectively; *deceptivum* (Banks), *nomen dubium*, remains the only North American species of *Lepidostoma* known solely from its female. Keys are provided for males, females and larvae to genus and subgenus, males to species, females of *Lepidostoma* (*L.*) to species, and larvae of *Lepidostoma* to species or species groups.

INTRODUCTION

Sexual dimorphism prevails throughout the Lepidostomatidae with variable secondary sexual characters so bizarre that McLachlan (1876) referred to this group (section IV of Sericostomatidae) as the "curiosity shop" of the Trichoptera. Many trichopterists have viewed these odd characteristic differences as a basis of recognizing new genera. As a result, 20 genera in the family are monotypic or contain only two or three species, reflecting a general indecisiveness regarding generic relationships within the family. Furthermore, this problem is evident in certain monophyletic species groups within the genus *Lepidostoma* which appear to include members of other "genera" from the Old World.

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[2] This is Technical Contribution No. 2832 of the South Carolina Agricultural Experiment Station, Clemson University.

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Ross (1938b) found it necessary to define the genus *Lepidostoma* very broadly and mentioned that a revision of the entire world fauna of the family would be necessary to correctly evaluate the genus. Consequently, Ross (1944, 1946) decided that the system of classification in use was artificial and presented a contrasting treatment for the Nearctic Lepidostomatidae. Rejecting the tradition of previous workers, he concluded that the secondary sexual characters of males were not important generic-level indicators. Accordingly, Ross (1944) included nearly all of the Nearctic genera in the synonomy of *Lepidostoma*. However, Schmid (1980) remarked that this solution was too radical and suggested that eventually the secondary sexual characters as well as others must be considered to provide a much desired revision of the world Lepidostomatidae.

Herein, *Lepidostoma sens. lat.* is recognized with four subgenera (*Lepidostoma, Mormomyia, Nosopus,* and *Neodinarthrum*) and 19 species groups. This position seems to offer more nomenclatural stability than the more subjective treatments of this group used in the past. However, this classification certainly is not intended to be final, rather it is offered as an improvement to the current treatment of the North American fauna. This scheme is a compromise between two general schools of thought regarding generic determination in Lepidostomatidae, that of the Old World which has been overly generous and that of the New World which has been too conservative. Presently, I refrain from splitting *Lepidostoma* into other genera until a more definitive revision of the world lepidostomatid genera can be provided.

In the bibliographies of each taxon that follow, original descriptions, junior synonyms, and pertinent works that have become available after 1960 are included (brackets are mine). Other earlier citations of the Lepidostomatidae are listed in the *Trichopterorum Catalogus* by Fischer (1970, 1973).

In the material examined, the known collectors correspond with their initials as follows: CPA, C. P. Alexander; NHA, N. H. Anderson; JHB, J. H. Baker; WFB, W. F. Barr; RWB, R. W. Baumann; JB, J. Bueno Soria; MRB, M. R. Butcher; PHC, P. H. Carlson; AD, A. Damph; CED, C. E. Dunn; DAE, D. A. Etnier; CMF, C. M. Flint; OSF, O. S. Flint, Jr.; THF, T. H. Frison; THF Jr, T. H. Frison, Jr.; ARG, A. R. Gaufin; DRG, D. R. Given; KG, K. Goeden; DLG, D. L. Gustafson; SWH, S. W. Hamilton; SCH, S. C. Harris; DDH, D. D. Herlong; RWH, R. W. Holzenthal; SGJ, S. G. Jewett; HDK, H. D. Kennedy; JK, J. Kingsolver; HBL, H. B. Leech; EMM, E. M. McEwan Hack; ECM, E. C. Masteller; JCM, J. C. Morse; APN, A. P. Nimmo; DLP, D. L. Peck; JP, J. Peck; SP, S. Prichard; WER, W. E. Ricker; HHR, H. H. Ross; JAR, J. A. Ross; MWS, M. W. Sanderson; LES, L. E. Serpa; PJS, P. J. Sieburth; SDS, S. D. Smith; WPS, W. P. Stark; RFS, R. F. Surdick; JLS, J. L. Sykora; KWS, K. W. Stewart; H & MT, H. & M. Townes; JSW, J. W. Weaver III; RLW, R. L. Wescott; TRW, T. R. White; GBW, G. B. Wiggins; RWW, R. W. Wisseman; JRW, J. R. Wood; TY, T. Yamamoto. Also, in the material examined following the collector's initials, the institution or person currently holding the specimens is indicated in parentheses and abbreviated as follows: BYUC, Brigham Young University; CASC, California Academy of Sciences; CNCI, Canadian National Collection; CUCC, Clemson University; DGD, Donald G. Denning's collection; SCH, Steven C. Harris's collection; INHS, Illinois Natural History Survey; MCZC, Museum of Comparative Zoology, Harvard University; OSUO, Oregon State University; PURC, Purdue University; ROME, Royal Ontario Museum; LES, Larry E. Serpa's collection; SDS, Stamford D. Smith's collection; USNM, Smithsonian Institution, National Museum of Natural History; UASM, University of Alberta, Entomology Department; UICM, University of Idaho; ECUT, University of Tennessee; JSW, author's collection.

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Finally, I am appreciative to all former trichopterists (especially Herbert H. Ross) who, in gathering systematic information, laid the foundation upon which this work was constructed. I am indebted to them all!

LEPIDOSTOMATIDAE ULMER

Ulmer 1903:89 (Lepidostomatinae); Ross 1964:214, f. 6; Lepneva 1966:6, 14, 62, 349; Ross 1967:174, 178, f. 1; Unzicker 1968:4, 14, 19-20, 30, 31, 48-51; Fischer 1970:3; Tani 1971:45-48; Fischer 1973:162; Macan 1973:7, 12, 14, 90, 92, 93; Hilsenhoff 1975:24; Anderson 1976:116; Wiggins 1977:13, 16, 19, 21, 31, 154, 155; Solomon and Leiser 1977:32, 151, 166, 172, 178, 183; Ross 1978:2, 3, f. 1; Wiggins 1978:147, 158, 163, 173, 179; Pennak 1978:601, 616; Schmid 1980:24, 147-149; McCafferty 1981:241, 243, 264; LaFontaine 1981:157, 247-253; Hilsenhoff 1981:28; Unzicker et al. 1982:9.4, 9.6, 9.6A, 9.9, 9.15, 9.19, 9.24, 9.103, 9.104-9.107; Wiggins 1984:272, 275, 277, 284, 291, 294, 306, f. 16.19, 16.76, 16.105, 16.154.

The Lepidostomatidae consist of approximately 285 extant species known. The family is predominately Holarctic, Afrotropical, and Oriental in distribution, with however a few species occurring in the northern fringes of the Australian Region (New Guinea) (Neboiss 1986) and the Neotropical Region (Panama to Mexico) (Flint and Bueno 1977). They were first recognized as a subfamily of Sericostomatidae by Ulmer (1903) and later elevated to full family status by Ross (1944).

The lepidostomatids made available as of 1960 inclusively, were cataloged by Fischer (1970, 1973). Since 1960 the status of a few genera has changed. In a review of the Japanese lepidostomatids, Tani (1971) presented two new genera, *Yamatopsyche* and *Paradinarthrodes*. The genus *Trichovespula* Schmid (1955) of Chile, originally considered to be a lepidostomatid, was reviewed by Flint (1967b) and subsequently placed in the Tasimiidae (Flint 1974). Two monotypic genera *Atomyiodes* Banks and *Eremopsyche* Banks from Central America joined the long list of junior synonyms of *Lepidostoma* (Denning 1962, Flint 1967a, Flint and Bueno 1977). Ito (1984) recognized *Yamatopsyche* Tani as a new junior synonym of *Goerodes* Ulmer.

A comprehensive review of the Nearctic Lepidostomatidae was presented by Ross (1946) who listed 4 species of *Theliopsyche* and 34 species and 6 species groups of *Lepidostoma*. Other major works on North American lepidostomatids followed by Denning (1956), Flint and Wiggins (1961), and Flint and Bueno (1977). Since Ross's (1946) review the number of North American species has more than doubled to 6 species of *Theliopsyche* and 73 species of *Lepidostoma*.

Egg and Oviposition

Observations on Trichoptera eggs and oviposition are not abundant. However, works on this subject by Anderson and Wallace (1984), Hinton (1981), Silfvenius (1906), LaFontaine (1981), and Wiggins (1973) are highly informative.

In Lepidostomatidae, egg extrusion occurs prior to the act of oviposition, long before the female releases her spawn. To carry the eggmass, the egg pouch becomes concave by the contraction of sternites VII and VIII, and segment IX remains unaltered, overhanging the eggmass like a hood.

There are few reports on the oviposition of Lepidostomatidae. Milne (1943) observed many females of *Lepidostoma (L.) togatum* in July "ready for oviposition, as each had a spherical mass of light green eggs hanging from the tip of the abdomen." Later he found several such eggmasses in the water. Also, in July, Roos (1957) netted 20 females of *L. (L.) hirtum*, eight of which were carrying eggmasses. Anderson (1976) found many eggs of *Lepidostoma* in the water. Ross (1944) states that lepidostomatids deposit eggs in or near the water. Solomon and Leiser (1977) report that eggmasses are dropped on damp areas near the water or actually in the water. These reports have been corroborated by R. W. Wisseman (pers. comm.), who observed that *L. (Nosopus) podagrum* and *L. (N.) quercinum* swarm at dusk and drop their eggmasses directly into the stream during flight; the eggmasses are very sticky and tend to adhere to benthic substrates. He also saw females of *L. (N.) jewetti* oviposit eggmasses directly on damp wood in seepage areas.

I have examined eggmasses attached to specimens of *Lepidostoma* pinned dry and preserved in alcohol. A greater percentage of pinned females have eggmasses retained than those of alcohol collections. Apparently eggmasses are often dislodged and separated from insects collected and stored in fluids, or they may be discarded since it is difficult to associate eggmasses with corresponding females.

Larva

Review. Larval descriptions of lepidostomatids have been made available by Hickin (1967), Ito (1978), Lepneva (1966), Morse and Holzenthal (1984), Nielsen (1942), Ross (1944), Ulmer (1903, 1955) and Wiggins (1977, 1984).

Body. Eruciform.

Head. Hypognathous, distinct from all other caddisflies (except Oeconesidae and Calocidae) by having antenna adjacent to eye. Apical portion of antenna seated on small basal lobe. Genae almost meeting near ventral ecdysial line. Labrum elliptical, its maximum width about a third that of head and about half as long as wide, usually bearing small membranous anterolateral fringe. Eyes dorsolateral, a distance of about a third length of head posteriad of mandibles. Known larvae of *Theliopsyche* and some species of *Lepidostoma (Nosopus)* from Central America have cranial carinae.

Mouthparts. Similar to those of most other phytophagous caddis larvae and lepidopteran caterpillars (Snodgrass 1935). Maxilla, labium, and hypopharynx united to form composite structure, with maxillolabial-hypopharyngeal complex which projects forward like lower lip. Mandibles small and triangular with scraperlike ventromesal edge. Maxilla with cardo, stipes, and palpifer, supporting four-segmented palps and rounded lobelike galea bearing several sensilla. Labium with triangular postmentum and rectangular mentum and prementum; these collectively supporting pair of rodlike palpigers, two small lateral palps with apical sensilla, and single apical spinneret.

Thorax. Nota predominantly sclerotized. Sternum with few sclerites. Pronotum completely sclerotized by two large plates separated narrowly by middorsal ecdysial line. Prosternal horn present. Mesonotum almost completely covered by pair of heavily sclerotized square plates, separated narrowly by middorsal ecdysial line. Metanotum mostly membranous, usually with three pairs of sclerites: lateral pair, *setal areas* 1, anteromesal pair, *sa*2, and posteriomesal pair, *sa*3. Anterior leg broadest and shortest, with small triangular trochantin. Middle leg approximately 1.8 times longer than foreleg. Posterior leg 1.5 times longer than foreleg. Posterior coxa with dense patch of branched or plumose setae.

Abdomen. Round sagittally and usually with dorsolateral and ventrolateral row of single filamentous gills on segments II-VII, with varying numbers, sometimes none. Segment I with pair of lateral humps, but middorsal hump absent. Lateral fringe sparse or absent, and lateral tubercles usually present on segments II-VII. Segment VIII with pair of lateral lobes similar to those of *Micrasema*. Segment IX with small tergite bearing four major setae. Anal prolegs small and similar to those of most limnephilids. Anal papillae usually present.

Pupa

Review. The key to pupae of the North American Trichoptera families provided by Wiggins (1984) is highly recommended for identification purposes. Other pupal descriptions of lepidostomatids have been made available by Hickin (1949, 1967), Lepneva (1966), Ross (1944), and Ulmer (1909, 1955).

Head. Antennae not excessively long, extending only short distance posteriorly of abdominal segment VIII. Labrum semicircular. Mandibles triangular, stout and pointed apically, being similar to those of most limnephilids. Maxillary palps two-segmented or apparently one-segmented in male pupae and five-segmented in female pupae. Labial palps always three-segmented.

Thorax. Wingpads appressed against side of abdomen. Middle tarsae modified for swimming with many fine lateral setae.

Abdomen. Posteriolateral corners of tergite I with dentate ridge. Terga of segments III-VII each with an anterior pair of hooked-plates, each bearing four or five short spines pointed posteriorly. Segment V with posterior pair of hooked plates each bearing five short spines pointed anteriorly. Lateral fringe of abdomen abbreviated. Abdominal gills single, filamentous, present on segments II-VII and apparently corresponding in number and position with those of larva. Anal processes, short stout lobes, about twice as long as wide and usually obliquely truncated and with four long major apical setae. Hickin (1949, 1967) indicated that the anal processes of *Lepidostoma hirtum* are long and slender, but apparently his figures of this species and *Goera pilosa* have been mismatched.

Case

Lepidostomatid larvae construct many different types of cases (f. 1-6), and those of some species groups are distinctive. The larva of *Lepidostoma (Neodinarthrum)* constructs a case of fine sand grains (f. 1) which is very slender and tapered posteriorly. The larva of *Theliopsyche*, the *libum* group of *Lepidostoma (Mormomyia)* and the *mexicanum* and *hoodi* groups of *Lepidostoma (Nosopus)* predominantly construct stouter cases of small stones (f. 2, 3). Also, a western species of *Lepidostoma*, possibly *L. (N.) verodum*, constructs a unique spiral case (Wiggins 1977: f. 8.1 G).

Early instar larvae of most lepidostomatids appear to build cases of stones and the later instars of several species adhere to this primary case construction plan (f. 1-3). However, later instars of many species switch to a secondary construction plan in which the larvae make cases of stems, leaves, and other phytogenic debris that they commonly use to construct either a panel case (f. 4) or a turret case (f. 5, 6). Construction of the panel case was documented by Sattler (1957) for the larva of *Crunoecia irrorata*; the larva cuts an oval piece out of a leaf and then chews four small pieces from the two lateral sides, forming a hexagonal-shaped panel. Panels are fitted together tightly and arranged in a staggered pattern, positioned opposite the transverse seams of adjacent sides. This probably reduces the amount of silk needed to glue seams together and provides longitudinal rigidity. Individual leaf panels are slightly flexible, so that cases predominantly composed of leaf material are usually somewhat round sagittally, resembling a cigar (f. 4) as in the *modestum* group of *L. (Nosopus)*. Occasionally, paneled cases are made from bark or wood and are square sagittally (Wiggins 1977: f. 8.1 C). Small stones may be incorporated intermittently in cases, especially cases which are constructed during the transitional construction phase.

The turret case (f. 5, 6), resembling the turret of a wolf spider, consists of a whorl of small stems or other long slender plant fragments arranged transversely and is typical of the *unicolor* group of *L. (Nosopus)*. The length of transverse pieces may vary according to species, and the lengths of stems incorporated into an individual case may be similar or variable.

Adult

Review. Major contributions to lepidostomatid adult taxonomy and morphology have been made available by Crichton (1957), Denning (1956), Flint and Bueno (1977), Flint and Wiggins (1961), McLachlan (1876), Mosely (1939a, b), Ross (1944, 1946), Schmid (1980), Tani (1971), Ulmer (1907, 1909, 1951) and Wiggins (1984).

Body. Adult lepidostomatids are medium-sized (forewing length 4-14 mm), usually dull brown in color, and with elliptical wings. Males exhibit many extraordinary secondary sexual characters in their wings, thorax, and appendages of the head. These characters vary greatly and may be involved with dispersion of pheromones, and thus compensating for the lack of the abdominal scent glands of segment V. Moretti and Bicchierai (1981) discerned that stout cylindrical setae in the basal pocket of the forewing's anterior margin of *Lasiocephala basalis* are androconia. Furthermore they hypothesized that a secretion is discharged into the bristle lumen and subsequently dispersed through many small exterior bristle holes. Similar stout setae (probably androconia) also occur on specific areas of the scape, head, thorax, and wings (f. 10-13) of many lepidostomatid males. Frequently setae are modified as scales which may be adjacent to stout setae or segregated in areas of the wings and maxillary palps. However, *Lepidostoma (N.) podagrum* is a curious exception in having modified setae on the anterior basotarsus (f. 29). Modified setae that occur on appendages may be petiolate. Size of setose warts are sometimes dissimilar in sexes; for example, in males, warts of the mesoscutellum are larger in *L. (Mormomyia) griseum*, smaller in *L. (N.) cascadense*, and absent in *L. (L.) latipenne*.

Head. Head short, with eyes large, apparently glabrous. Ocelli absent. Lateral, frontal and three dorsal pairs of setose warts usually present. Males often with modified secondary sexual characters in scape and maxillary palps. Antennae extending posteriorly about as far as apices of forewings in their folded position. Length of scape variable, often longer than head, but with several exceptions among males. In New World lepidostomatids, scape often shorter in males and longer in females, often vice versa in Old World species. For example, in *Dinarthrum* the male scape often is 4-9 times as long as the head; in *Dinarthrodes* the scape is sometimes longer and is usually subdivided with a false joint. A great amount of intraspecific variation has been observed in the male scapes of *Dinarthrum iranicum* by Schmid (1959) and of *Neoseverinia crassicornis* by Ito (1983). Pedicel usually no longer than first segment of flagellum, constricted and pivoted basally, as in most caddisflies, but sometimes longer or modified as in *Lepidostoma (Nosopus) ermanae, spicatum, verodum* and *hoodi*. Flagellum with about 30-40 segments, each simple and cylindrical. Tentorium complete (f. 14), in lateral view shaped like inverted T. Anterior and dorsal arms of tentorium diverging from posterior arms mesad. Dorsal arms slender, perpendicular to posterior and anterior arms, and fused with head capsule near antennal bases. Anterior arms are shorter and in line with posterior arms. Labrum in lateral view shaped like small beak, about three times as long as broad with slightly bulbous base and pointed apex. Mandibles small inconspicuous lobes. Maxillary palps five-segmented in females and two-segmented or apparently one-segmented in males. Haustellum anterior surface with system of converging channels through which liquids are imbibed.

Thorax. Pronotum with two pairs of setose warts, mesoscutum and mesoscutellum each usually with one pair of warts, and metanotum without warts. Warts of pleuron variable in number. In *Lepidostoma*, propleuron with one pair, mesopleuron with two pairs and metapleuron with one pair. In *Theliopsyche*, setose warts smaller and fewer in number. Legs with few spines but densely covered with small setae. Spurs also very setose (f. 11). Tibial spur count always 2, 4, 4 (f. 15) on the fore, middle and hind legs, respectively.

Wings. Herein the Comstock-Needham wing venation system is employed. Lepidostomatid wings are elliptical because anal regions are reduced and apices are rounded. In Trichoptera, unique differences in wing venation often have been regarded as important generic-level indicators. However, because sexual dimorphism causes excessive variation in the venation of male lepidostomatids, Mosely (1939a) suggested that "the practice should be reversed and that where species can be conveniently grouped on a similarity of genitalia, this character should be considered as pertaining to the genus and that the species should be separated on neuration." In most lepidostomatid females wing venation is consistent and more complete than in males. However, in *Theliopsyche* the wing venation of males and females is very similar.

Anterior wing: Costa (*C*) normally straight, but in males sometimes curved anteriorly, forming marginal costal cell area of various size folding over the wing or sometimes forming small basal pocket. Many modified setae often in this anterior marginal fold. Subcosta (*Sc*) heavy, straight, usually parallel with radius (*R*). Discal cell (*d*) delimited by first fork of radial sectorial veins and sectorial crossvein (*r*), long in forewing, and much smaller in hindwing. Radial sector (*Rs*) branched into four apical veins (*R*2, *R*3, *R*4, *R*5); fork of *R*2+3 defining first fork (*F*1) and fork of *R*4+5 defining *F*2. Media (*M*) rarely unbranched; usually branched into *M*1+2 (*Ma*) and *M*3+4 (*Mp*); *Ma* sometimes branched, forming *F*3, but *Mp* never separating, such that *F*4 always absent in Lepidostomatidae. Thyridial cell (*th*) delimited by bases of median and cubital veins and mediocubital crossvein (*m-cu*), usually long and containing a thyridium (a small transparent spot, similar to the nigma) in females, but usually absent in males. Cubitus (*Cu*1) thick and usually branched into *Cu*1a and *Cu*1b, delimiting *F*5. Postcubitus (*Cu*2) unbranched, normally converging with crossvein (*cu-a*) and anal veins (1*A*, 2*A*, 3*A*) in distal submarginal hyaline area, the arculus (*ar*). However, these veins often confounding due to secondary modifications of males. Usually two anal cells (anal loops) present, anterior cell (1*a*) and posterior cell (2*a*), delimited by 1*A*, 2*A* and 3*A*. These veins diverging basad and then fusing distad. However, sometimes one or both anal cells absent. Anterior cell sometimes open with 1*A* terminating in posterior margin independently. When both cells absent, 2*A* and 3*A* apparently fused with 1*A* terminating in hind margin independently.

Posterior wing: *Sc* and *R* often thick and closely appressed. In males *F*1 present and *F*2 usually absent, *R*4 apparently fused with *R*5. In Trichoptera it is difficult to determine the location of *R*5 when it is not isolated.[1] In Lepidostomatidae it usually appears to be fused with *R*4 above the nigma. This is suggested by the observation that *R*4 and *R*5 are obviously fused in male hind wings of *Lepidostoma (M.) vernale* (f. 126) and in *L. (N.) unicolor* and *L. (N.) acarolum* (f. 47, 50). *M* usually with *Ma* and *Mp* each unbranched and *F*3 and *F*4 absent. In male *Cu*1 usually unbranched, hence without *F*5; 1*A*, 2*A* and 3*A* usually terminating independently in posterior margin, but 1*A* and 2*A* often partially fused and then diverging distad, or they may be completely fused.

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[1] However, Betten (1934) and Morse (1975) have taken the position that the nigma always identifies *F*2; hence, when the nigma is evident, *R*5 is always posterior of it.

Abdomen. In lepidostomatids, abdominal hemobrachial apparatus well developed and composed of simple filaments about as long as segment I (Schmid 1980). The scent glands of sternite V are absent in both sexes, being one of the most outstanding derived characters of the Lepidostomatidae.

Male Genitalia

Review. Important contributions on homologies of Trichoptera male genitalia have been provided by Morse (1975), Mosely (1939a), Nielsen (1957), Ross (1944, 1956), and Schmid (1970, 1980). However, because all of these workers use different systems of morphological nomenclature, it is necessary to clarify the terms used herein.

Segment VII. *Theliopsyche* with depressed rounded midventral process (f. 19, 23). *Lepidostoma (Mormomyia)* males with pair of dorsal setose warts.

Segment VIII. Lepidostomatids without sternal process. *Lepidostoma (Mormomyia)* males with pair of dorsal patches of major setae.

Segment IX. Completely sclerotized ring. In *Lepidostoma (L.)* with pair of sclerotized straps of phallocrypt extending from posterior lateral margins near base of segment X to articulate with base of phallus and basal plate of inferior appendages (f. 176). *Lepidostoma (Mormomyia)* males (f. 127) and females (f. 142) with pair of dorsal patches of major setae.

Segment X. Fused with dorsum of segment IX. Preanal appendages absent or expressed only as small dorsal setose lobes. Main body consisting of paired dorsal superior processes, usually fused together and sometimes with a pair of lateral processes. Intermediate appendages apparently absent, but possibly present as lateral processes in *Theliopsyche* (f. 19), several species of *Lepidostoma (L.)* (f. 179), and the *canthum* group of *L. (Neodinarthrum)*. Anus directly below segment X, in *L. (Mormomyia)* opens from large membranous lobe.

Phallus. Above inferior appendages, with its base situated in membranous phallocrypt. Phallocrypt outer circumference attached to posterior edges of segment IX, base of segment X, and basal plate of inferior appendages. Phallocrypt near its center united with circumference of cylindrical phallus. Resulting ental portion of phallus defines phallic apodeme. The portion of phallus inside the phallocrypt is the phallobase. Sclerotized phallocrypt immediately surrounding phallus defines phallic shield. In *Theliopsyche* phallic shield heavily sclerotized obscuring phallobase from view (f. 19), in *L. (Mormomyia)* semispherical (f. 127), in *L. (Neodinarthrum)* spoon-shaped (f. 160), in *L. (Nosopus)* collar-shaped with extended dorsum (f. 60), and in *Lepidostoma (L.)* ring-shaped and attached to lateral sclerotized strips of phallic shield (f. 176). Membranous endotheca attached to apical portion of phallobase. Paired parameres superior, usually heavily sclerotized spiniform rods (f. 19, 160), but occasionally short (f. 58, 129) or apparently reduced to flexible membranous lobes (f. 71). However, in *Lepidostoma (L.)* and *Theliopsyche* (except *T. corona*) parameres absent. In *L. (Mormomyia)* parameres and phalicata often asymmetrical, and base of heavily sclerotized phalicata situated in bulbous endotheca. Phalicata short and straight in *Theliopsyche*, but in *Lepidostoma* strongly curved at base, being somewhat semicircular. Ejaculatory duct entering phallus through phallic apodeme, extending along its axis, and terminating in phallotremal sclerite in dorsomesal subapical concavity of endophallic membranes.

Inferior appendages. Very setose, usually short and stout in *Theliopsyche*, but more long and slender in *Lepidostoma*. First article with four distinct processes, some of which may be absent or reduced: (1) second article inconspicuous lobe (f. 129) or obvious subapical mesal process (f. 179); (2) basodorsal process usually vertical at basal position on first article; in *Theliopsyche* usually short and thumblike (f. 19); but in *T. grisea* and *tallapoosa* long (f. 21); in *Lepidostoma* often capitate, usually long, slender (f. 179) or sometimes reduced (f. 68); in *L. (Nosopus) modestum* group (f. 71) slender, capitate, horizontal and about as long as first article; (3) horizontal process in *Lepidostoma (L.)* (f. 179) a basomesal process, apparently functioning as phallic guide; in *L. (Mormomyia)* (f. 127) and most species of *L. (Nosopus)* (f. 66) a middorsal process of first article, apparently aiding in clasping female, but absent in *Theliopsyche*, the *modestum* group of *L. (Nosopus)*, and *L. (Neodinarthrum)*; (4) ventromesal ridge broad with apical angle in *Theliopsyche* (f. 19) and several species of *Lepidostoma* (f. 158, 179).

Female Genitalia

Review. Detailed investigations of female Trichoptera morphology have been made by Nielsen (1980) and Unzicker (1968). Other important points regarding caddisfly female genitalia have been mentioned by Schmid (1980) and Matsuda (1976).

General characters. In Lepidostomatidae the female genitalia are typical of Integripalpia being blunt, without the "functional ovipositor" (tubulus) typical of Annulipalpia, without long slender anterior apophysis of segments VIII and IX, cerci absent, rectum and common oviduct separate (hence cloaca absent), common oviduct opening between segments VIII and IX, rectum above common oviduct, opening within segments IX+X.

Segment VI and VII. Circular sagittally, without sternal processes, pleura unsclerotized.

Segment VIII. Tergite curved sagittally, well developed, extending over pleuron. Sternite (ventral plate) flattened, slightly reduced, forming concave surface (egg pouch) for temporary retention of eggmass; in *Theliopsyche* with posterior margin bearing medial and lateral pair of lobes, in *L. (Neodinarthrum)* (f. 167) chalice-shaped, in *L. (Nosopus) modestum* group U-shaped with posterior margin emarginated, and in *L. (Nosopus)* and *L. (Mormomyia)* with several longitudinal striations indicating flexibility.

Segment IX+X. Tectiform (roof-shaped) with two blunt anterolateral apodemes. Segment X inconspicuous, reduced to posterior pair of small broad lobes, almost completely integrated with segment IX.

Spermathecal sclerite. Also referred to as "appareil vaginal" (Schmid 1980) or "processus spermathecae" (Nielsen 1980), heavily sclerotized internal process, constricting posterior end of spermathecal duct, between spermatheca and common oviduct, possibly regulating sperm discharge from spermatheca or sperm intake from male phallus via common oviduct. In ventral view somewhat oval, bell-shaped, triangular, or pentagonal; in lateral view trapezoidal. With lateral pair of bands fusing ventrally, in ventral view sometimes with lateral lobes. Also with anterodorsal process and posteroventral process. In ventral view anterodorsal process broad and posteroventral process narrow, long, medial, keyhole-shaped, bearing spermathecal duct opening posteriorly. In lateral view anterodorsal process cup-shaped and posteroventral process forming ventral keel with lateral bands extending below.

Spermatheca. Spermatheca of *Lepidostoma (L.)* bearing many conspicuous microtrichia which usually occur in small clusters anteriorly, forming reticulate anterior pattern and being a good diagnostic character of species. Also, in this subgenus opening of spermathecal sclerite into posterior duct, often with valve bearing several spiniform processes. In other North American lepidostomatids spermatheca bearing less conspicuous microtrichia.

Keys to North American Lepidostomatidae Genera

Larva

1a. Length of postmentum (ventral apotome) less than half that of midventral ecdysial line of adjacent margins of genae (f. 7); case made of stones (f.3); eastern .... *Theliopsyche*, p. 10.
1b. Length of postmentum subequal to or greater than that of midventral ecdysial line of genae (f. 8, 9); case made of stones or of various plant fragments (f. 1-6); widespread .... *Lepidostoma*, p. 15.

Adult

1a. Head dorsum with pair of setose warts oval, aligned with occipital margin, and small (f. 15); male with sternal process on abdominal segment VII (f. 19); female posterior margin of sternite VIII with medial and lateral pair of small tubercles (f. 24); eastern .... *Theliopsyche*, p. 10.
1b. Setose warts somewhat teardrop-shaped or oval, not aligned with occipital margin, large, occupying most of area between the eyes and occipital margin (f. 28, 124, 151, 169); male without a sternal process on abdominal segment VII; female without two pairs of tubercles on the posterior margin of sternite VIII (f. 167); widespread .... *Lepidostoma*, p. 15.

Theliopsyche Banks

Theliopsyche Banks 1911:356, type species: *parva*, monobasic; Unzicker 1968: 11, 14, 19-20, 32, 48, 49, f. 22 (female); Fischer 1970:92-93; Wiggins 1977:13, 154, 158, f. 8.2A-E (larva); Pennak 1978:610; Wiggins 1978:179 (larva, pupa); Unzicker et al. 1982:9.19, 9.104-9.107, f. 9.257 (larva); Wiggins 1984:306; Morse and Holzenthal 1984:324, f. 17.104.
Quisilo Milne 1936:118, 124, type species: *Silo griseus* Hagen, original designation.
Aopsyche Ross 1938a:174, type species: *corona*, original designation.

Etymology: Greek, *thelion*, little nipple; *psyche*, butterfly; gender feminine.

Body. Smaller than the majority of lepidostomatids, forewing approximately 5-6 mm long, color dark brown.

Head. Elongate pair of oval posterior warts aligned with occipital margin (f. 14, 15). Antennal scape longer than head, not highly modified, cylindrical and occasionally bearing several mesal bristles. Male maxillary palps always two-segmented with each segment distinct and cylindrical. Female maxillary palps five-segmented.

Wings. Little sexual dimorphism in wings (f. 16-18). Venation more complete than that of most other lepidostomatids. Forewings with *Ma* branched in both sexes and arculus with normal distal configuration of veins. Slight sexual dimorphism exhibited in forewing of *T. corona* and in the hindwing of *T. melas*. Venation usually differing between sexes only in posterior wing in which *R*4+5 unbranched (*F*2 absent) in males, but branched in females (typical of Lepidostomatidae). Posterior wing with discal cell open in both sexes.

Legs. Tibial spur count 2, 4, 4 on front, middle and hind legs, respectively (f. 15).

Abdomen. Males distinguishable by having paddle-shaped sternal process on abdominal segment VII (f. 19, 23) (not on segment VIII as reported by Ross [1944, 1946] and Schmid [1980]).

Male genitalia. Segment IX (f. 19) long in lateral view with anterior margin of pleuron projecting cephalad and posterior margin nearly straight, pleuron at least two times as long as venter, dorsum reduced. Segment X usually about as long as inferior appendages, lateral processes usually prominent and spiniform (reduced in *T. grisea*). Preanal and intermediate appendages apparently absent. Phallus straight, phallotremal sclerite large, parameres present only in one species, *T. corona*; phallobase obscured by heavily sclerotized phallic shield. Each inferior appendage with (1) first article usually longer than basodorsal process (except in *T. grisea* and *tallapoosa*); (2) small apicomesal point of first article possibly rudiment of second article (The first article is a midprocess, recognized by having an apicomesal toothlike process.); (3) basodorsal process usually short and thumblike, but sometimes long and fingerlike or acuminate; and (4) ventromesal ridge usually extending along basal half of main article.

Female genitalia. Posterior margin of sternite VII with two pairs of short points (f. 24). Spermathecal sclerite with long pointed anterior process in ventral view.

Immatures, case and habitat. Larva with postmentum about half as long as midventral ecdysial line. Case cylindrical and made of stones. I have collected adults of *T. grisea* twice, on both occasions near a spring. Wiggins (1977) mentioned that the larvae of *T. melas* were found in a small spring, also. It seems likely that most species of this genus are endemic to mountain springs, but Harris (1986) has collected adults of *T. tallapoosa* near a stream.

Distribution. This genus is distributed throughout the Appalachian Mountains from Quebec to Alabama. Few records are available, indicating that most species are somewhat uncommon.

Key to Adults of *Theliopsyche* Species
(males)

1a. Parameres present (f. 19); Mountains of North Carolina and Tennessee .... *corona* Ross, p. 12.
1b. Parameres absent (f. 20) 2

2a. Dorsal process of each inferior appendage greatly extended posteriorly beyond main body (f. 21) 3
2b. Dorsal process of each inferior appendage short, not extended posteriorly beyond its main body (f. 20) 4

3a. Lateral processes of segment X shorter than main body; dorsal process of inferior appendages fingerlike (f. 21); mountains of New Hampshire to South Carolina .... *grisea* (Hagen), p. 13.
3b. Lateral processes of segment X longer than main body; dorsal process of interior appendage acuminate (Harris 1986: f. 3); Alabama .... *tallapoosa* Harris, p. 15.

4a. Lateral processes of abdominal segment X sinuate (f. 22); posterior wing broad, with many stout setae (f. 18); mountains of Kentucky, Tennessee, and Virginia .... *melas* Edwards, p. 14.
4b. Lateral processes of segment X straight (f. 20); posterior wings oval, with normal setae (f. 17) 5

5a. Mesal processes of segment X almost completely fused and long, each about six times as long as basal width; ventral process of each inferior appendage longer than basodorsal process (f. 20); mountains of North Carolina and Tennessee .... *epilonis* Ross, p. 12.

5b. Mesal processes of segment X fused together about 0.6 times their length and short, each about 2.5 times as long as basal width; ventral process of each inferior appendage shorter than basodorsal process (f. 23); Massachusetts, New York, and Quebec .... *parva* Banks, p. 14.

Theliopsyche corona Ross
(f. 10, 14-16, 19, 24)

Theliopsyche corona Ross 1938a:174, f. 116 (male); Wray 1967:57; Fischer 1970:94; Etnier and Schuster 1979:20; Webb 1980:98; Unzicker et al. 1982:9.106, 9.107.

Male. Head (f. 14, 15). Scape, cylindrical, approximately 0.5 mm long, with several long mesal setae. Maxillary palps, with two distinct cylindrical segments, approximately 1.1 mm long (about twice as long as in other species of the genus). Wings (f. 16). Anterior wing with specialized region between *C* and *R* bearing many modified setae (f. 10); *C* very thick, *Sc* apparently branched distad, *R*1 atrophied before reaching the margin, basal stems of *R*2, *R*3, *R*4 close together. Hindwing normal for the genus. Genitalia (f. 19). Segment IX with unusual sclerotized pattern on dorsum. Segment X with rounded dorsum and lateral processes spiniform and long. Phallus with parameres present (absent in all other species of the genus). Inferior appendage with basodorsal process short and thumblike, main article extended about as far as lateral processes of segment X, ventromesal ridge angled with blunt apex.

Female. Antennal scape about 0.5 mm long. Wings (f. 16) normal for the family. Anterior wing with nigma and thyridium, length approximately 6 mm. Genitalia (f. 24) having spermathecal sclerite short and posterior margin of sternite VIII with mesal points separated by wide square notch.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 27 May - 2 July.

Distribution. Only known from the Great Smoky Mountains National Park of North Carolina and Tennessee.

Type data. Ross (1938a): "*Holotype*, male. - Gatlinburg, Tennessee: May 27, 1934, along branch of Little Pigeon River, T. H. Frison." Holotype at the INHS (Webb 1980). See type material examined below.

Material examined. Allotype female, (INHS). **NORTH CAROLINA:** Great Smoky Mts Natl Pk, Wild Cherry Branch, male, 8 VI 1949, WER, (INHS); Andrews Bald, 6 males, female, 18 VI 1947, CPA, (USNM). **TENNESSEE:** Gatlinburg, Great Smoky Mts Natl Pk, Peach Gap, male, 2 VII 1947, RH Whittaker, (USNM).

Theliopsyche epilonis Ross
(f. 20, 25)

Theliopsyche epilone Ross 1938a:173-174, f. 115 (male); Wray 1967:57; Fischer 1970:93; Etnier and Schuster 1979:20; Webb 1980:98; Unzicker et al. 1982:9.106, 9.107.

Male. Scape 0.6 mm long, cylindrical. Maxillary palps 0.8 mm long. Wings similar to those of *T. parva*. Genitalia (f. 20) with segment X having mesal process in dorsal view straight, slightly constricted basally, about six times as long a basal width, with two short apical humps; and lateral process spiniform, nearly straight, almost as long as mesal process. Phallus straight, without parameres, phalicata subequal to length of segment X. Inferior appendages with basodorsal process in lateral view small, thumblike, about half as long as main article which is slightly curved.

Female. Genitalia (f. 25) with spermathecal sclerite in ventral view similar to that of *T. parva* and *corona*, but unique in having keyhole-shaped process shorter, about half as long as its length.

Immatures, case and habitat. Unknown.

Life history. Recorded flight date: 13 June.

Distribution. Great Smoky Mountains National Park, North Carolina and Tennessee.

Type data. Ross (1938a): "*Holotype*, male. - Newfound Gap, North Carolina: June 13, 1935, along Little Pigeon River, H. H. Ross. *Paratypes*. - North Carolina. - Same data as for holotype, 3 males." Holotype at the INHS (Webb 1980). See type material examined below.

Material examined. Holotype male and allotype female, (INHS).

Theliopsyche grisea (Hagen)
(f. 21)

Silo griseus Hagen 1861:293 (male).

Theliopsyche grisea: McConnochie and Likens 1969:150; Fischer 1970:93; Schmid 1980:150, f. 541, 544-550 (male, female); Parker and Voshell 1981:6; Unzicker et al. 1982:9.106, 9.107.

Male. Scape 0.5 mm long. Maxillary palp 0.5 mm long. Wings similar to *T. parva*. Genitalia (f. 21). Segment IX in lateral view similar to *T. corona*, but without dorsal pattern. Segment X reduced with slender lateral processes (sometimes reduced or apparently broken). Phallus without parameres; phalicata about as long as segment X, with phallotremal sclerite large, about 0.7 times as long as phalicata. Inferior appendages each with dorsal process long, about twice as long as segment X and extended far beyond other processes of main article. This species and *T. tallapoosa* are the only species in the genus for which the dorsal process is the longest process of the inferior appendage.

Female. Genitalia (Schmid 1980: f. 550) similar to *T. corona* and *parva* in having a short triangular spermathecal sclerite. Posterior margin of sternite VIII with mesal points separated by a wide, square notch wider than the length of one point.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 19 May - 14 August.

Distribution. Known from the Appalachian Mountains of New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia.

Type data. Hagen (1861): "Hab. Trenton Falls (Osten Sacken)."

Silo griseus Hagen, *New Lectotype*, male: Trenton Falls, New Jersey, 1854, O. Sacken. MCZC Type 10951. See type material examined below.

Material examined. Lectotype male, (MCZC). NEW HAMPSHIRE: Grafton Co: West Thornton, Hubbard Brook, 4 males, K McConnochie, (USNM). NORTH CAROLINA: Swaine Co: Great Smoky Mts Natl Pk, Juneywhank Falls, Deep Cr Cpg, male, 21 V 1970, OSF, (USNM). SOUTH CAROLINA: Oconee Co: Sumter Natl Forest, Yellow Branch, 2 males, 19 V 1970, OSF, (USNM). . PENNSYLVANIA: Cumberland Co: Mount Holly Spring, Whisky Spring, 1 VI 1977, JSW, (JSW). TENNESSEE: Blount Co: Great Smoky Mts Natl Pk, small spring at camp 13 near Sheep-pen Gap, male, 13-14 VIII 1982, JSW & PJS, (JSW). VIRGINIA: Smyth Co: small stream N of White Top Mt, at Hwy 600, male, 10 VIII 1980, SWH, (CUCC).

Theliopsyche melas Edwards
(f. 7, 18, 22)

Theliopsyche melas Edwards 1956:16-17, pl. 1 f. 4-5 (male, female); Fischer 1970:93; Resh 1975:15; Wiggins 1977:158, f. 8.2A-E (larva); Etnier and Schuster 1979:20; Parker and Voshell 1981:6; Unzicker et al. 1982:9.107.

Male. Scape cylindrical, 0.6 mm long. Maxillary palps 0.8 mm long. Anterior wing similar to that of *T. parva*. Posterior wing (f. 18) slightly truncated apically, broad, with many modified, stout setae. Genitalia (f. 22). Segment X with mesal processes about 2.5 times as long as broad in dorsal view, apices attenuated and widely separated by long pointed notch; lateral processes sinuate, spiniform, and long, extended posteriorly as far as mesal processes. Phallus long, extended posteriorly as far as segment X, without parameres. Inferior appendages in lateral view each with short thumblike basodorsal process, main article extension about two times as long as basodorsal process, ventromesal ridge broad, freely extended posteriorly.

Female. Genitalia (Edwards 1956: f. 5) having spermathecal sclerite long and narrow, similar to that of *T. epilonis*, but apparently with longer keyhole-shaped medial process, greater than half length of sclerite.

Immatures, case and habitat. Larva (Wiggins 1977: f. 8.2), inhabiting a small spring; head ventral (f. 7).

Life history. Larvae collected 14-15 May. Recorded flight dates: 19 April - 28 June.

Distribution. Kentucky, Tennessee, and Virginia.

Type data. Edwards (1956): "*Holotype*, male. - Wellington Mills, four miles northwest of Winchester, Franklin County, Tennessee, on state highway 50, and one and one-half miles north of this highway on a rural road. April 19, 1955. Preserved in alcohol. S. W. Edwards. *Allotype* female. - Same data as holotype. *Paratypes*. - Same data as holotype. Four males, three females. Disposition of the type material. - Holotype and allotype deposited in the U.S. National Museum; paratypes to Illinois Natural History Survey, Vanderbilt University Entomological Collection, and the author's collection." See type material examined below.

Material examined. Paratypes, two males, (INHS). **TENNESSEE:** Franklin Co: 4 mi W of Wellington Mills, Hwy 50, 1.5 mi N of Winchester, 3 larvae, 14-15 V 1970, GBW & TY, (ROME); Putnam Co: 1st spring outflow, Hwy 84, 1 mi. S of Hwy 70N, 3 males, 6 VI 1972, DAE & C Saylor, (USNM).

Theliopsyche parva Banks
(f. 17, 23, 26)

Theliopsyche parva Banks 1911:356, pl. 12 f. 16 (male); Fischer 1970:93-94; Roy and Harper 1975:1085; Roy and Harper 1979:163; Schmid 1980:150.

Male. Scape 0.4 mm long, cylindrical. Maxillary palps 0.3 mm long, two-segmented, each segment cylindrical. Wings (f. 17). Anterior wing 4.2 mm long, venation typical for the genus, posterior wing also typical. Genitalia (f. 23). Segment X having mesal process somewhat rectangular with Y-shaped mesal notch in dorsal view, with dorsum and venter curved and with obtuse mesal notch and blunt subapical process in lateral view; lateral processes straight, spiniform, extending beyond apex of mesal process. Phallus straight, without parameres, phalicata about as long as lateral processes of segment X. Inferior appendages each with basodorsal process thumblike, short, less than half as long as extended main article; ventromesal ridge crooked, with small apical point.

Female. Forewing with venation similar to that of male. Hindwing (f. 17) with more complete venation than in male. Genitalia (f. 26) similar to those of *T. corona* and *grisea* with short triangular spermathecal sclerite in ventral view;

however, posterior margin of sternite VIII with mesal points close together with narrow V-shaped mesal notch.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 1 June - 24 July.

Distribution. Massachusetts, New York, and Quebec.

Type data. Banks (1911): "From Woodworth's Lake, Fulton County, New York, 23 June (Alexander)."

Theliopsyche parva Banks, *New Lectotypes*: There are four syntypes at the MCZC, Type 11710, of which one has been selected as *Lectotype* male and another as *Lectoallotype* female by Ross in 1937, but unpublished (Ross 1938b). Both of these specimens bear Ross's yellow lectotype labels and I herein recognize them as he intended. See type material examined below.

Material examined. Lectotype male and lectoallotype female, (MCZC). MASSACHUSETTS: Franklin Co: Sunderland Fish Hatchery, male, 2 females, 1 VI 1954, OSF, (INHS).

Theliopsyche tallapoosa Harris

Theliopsyche tallapoosa Harris 1986:34-36, f. 3A-G (male, female).

This species and *T. grisea* are the only species in the genus having male inferior appendages with dorsal process longer than the medial extension of the first article. It differs from *T. grisea* by having male, basodorsal process of the inferior appendage acuminate, rather than being fingerlike, and segment X with lateral processes longer than its main body. The following diagnosis is based on the original description by Harris (1986).

Male. Length 5.2 mm long. Color brown. Head with scape 0.4 mm long, maxillary palp 0.5 mm long. Genitalia: Segment X about half as long as inferior appendages, bearing lateral pair of spiniform processes longer than remainder of segment X and each process broadest mesad; main body comprising two trapezoidal plates, their basomesal halves fused together, and with blunt, lateral apices separated by acute mesal notch. Inferior appendages with dorsal process acuminate, and longer and broader than medial extension of first article. Phallus cylindrical and without parameres.

Female. Posterior margin of sternite VIII with mesal points broadly separated. Spermathecal sclerite fork-shaped having central keyhole-shaped process as long as lateral flanges which diverge caudad from its anterior at acute angles.

Immatures, case and habitat. Immatures unknown. Harris (1986) collected this species near a swift (6 m wide) stream, with rocky bottom.

Life history. Adults collected 19 May.

Distribution. Piedmont region of Alabama. Only known from the type locality.

Type data. Harris (1986): "*Holotype* male. - Alabama, Tallapoosa County, Timbergut Creek, downstream crossing Hwy. 22, 19 May 1984, S. Harris and P. Lago (USNM). *Paratypes*. - Alabama, same as above, 1 male, 1 female (USNM)."

Lepidostoma Rambur

Mormonia Curtis 1834:215 (preoccupied), type species: *gracilicornis* Curtis, syn. of *Phryganea hirta* Fabricius (selected by Fischer 1970).

Lepidostoma Rambur 1842:493, type species: *squamulosum* Rambur, syn. of *Phryganea hirta* Fabricius (selected by Ross 1944); Flint and Wiggins 1961:279-281 (*vernalis* group); Denning 1962:36-37, 39 (*Atomyiodes* syn.); Flint 1967a:23-24; Unzicker 1968:11, 14, 19, 32, 50, 51; Fischer 1970:33-37; Wallace and Sherberger 1972:222, 226-228 (*vernalis* group); Fischer 1973:162; Hilsenhoff 1975:24, f. 82, 83 (larva); Anderson

1976:116-118, f. 19 (larva); Solomon and Leiser 1977:166, 172, 178; Flint and Bueno 1977:375-378; Wiggins 1977:13, 154, 156, 158, f. 8.1A-H, (larva); Wiggins 1978:179; Pennak 1978:610; Schmid 1980:147, 148, 149, 150; McCafferty 1981:264; Hilsenhoff 1981:28, f. 83, 84 (larva); LaFontaine 1981:87, 147, 180, 195, 208, 248-252, 327; Dudley and Anderson 1982:9, 10; Unzicker et al. 1982:9.6, 9.6A, 9.9, 9.10, 9.19, 9.23, 9.103, 9.104-9.107, f. 9.256 (larva); Waltz and McCafferty 1983b:16; Wiggins 1984:306; Morse and Holzenthal 1984:324, f. 17.103.

Pristosilo Banks 1899:212, type species: *canadensis* Banks, syn. of *Mormomyia togata* Hagen (monobasic).

Notiopsyche Banks 1905:216, type species: *latipennis* Banks (original designation).

Oligopsyche Carpenter 1933:36, type species: *Notiopsyche carolina* Banks (original designation).

Neuropsyche Carpenter 1933:38, (preoccupied), type species: *tibialis* Carpenter (original designation).

Flura Milne 1936:118, 124 (new name for *Neuropsyche* Carpenter 1933), type species: *Neuropsyche tibialis* Carpenter (replacement).

Etymology: Greek, *lepis*, scale; *stoma*, mouth; gender neuter.

Similar to Ross (1938b, 1944) I define the genus *Lepidostoma* rather broadly. In respect to the Old World genera, *Lepidostoma* does not appear to be monophyletic. Only a revision of the world Lepidostomatidae will provide an accurate assessment of this genus.

Key to Larvae of *Lepidostoma* Species or Species Groups[1]
(final instars only)

1a. Case made of small stones (f. 1-3), or head sometimes with carina 2
1b. Case made of various plant fragments (f. 4-6), head without carina .. 13

2a. Case linear (f. 2), head without carina; eastern North America; *L. (Mormomyia) libum* group 3
2b. Case curved slightly posteriad (f. 1, 3), or head with carina; western 5

3a. Illinois to Wisconsin .... *L. (M.) libum* Ross, p. 68.
3b. Appalachian Mountains, Ohio, and Indiana 4

4a. Tennessee and North Carolina .... *L. (M.) excavatum* Flint & Wiggins, p. 67.
4b. Indiana to Massachusetts to Virginia .... *L. (M.) sommermanae* Ross, p. 69.

5a. Case slender, tapered posteriad and made of fine sand grains, posterior width less than 1.0 mm (f. 1), head without carina .... *L. (Neodinarthrum)*, p. 75.
5b. Case more robust, not so markedly tapered posteriorly and usually made of larger stones, posterior width greater than 1.0 mm (f. 3), or head with carina 6

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[1] Larvae of *L. (N.) reosum* (*reosum* group) and *L. (N.) deceptivum* (*nomen dubium*) are unknown. Also, larval cases of *L. (N.) cinereum* and *L. (M.) libum* are known to vary.

6a. Rocky Mountains and Pacific coastal regions 7
6b. Arizona and southern Colorado to Panama; *L. (Nosopus) mexicanum* group 10

7a. With abdominal gills 8
7b. Without abdominal gills; *L. (Nosopus) hoodi* group 9

8a. Metanotal *sa*1 and *sa*2 sclerites large, oval, each with 15-20 setae .... *L. (N.) cascadense* (Milne), p. 57.
8b. Mesonotal *sa*1 and *sa*2 sclerites small, round, each with 1-2 setae .... *L. (Nosopus) astaneum* group, p. 25.

9a. Northwestern, Oregon to British Columbia .... *L. (N.) hoodi* Ross, p. 56.
9b. North central Rocky Mountains, Alberta to Utah .... *L. (N.) spicatum* Denning, p. 56.
9c. Northern Sierra Nevada Mountains of California .... *L. (N.) ermanae* Weaver p. 55.

10a. Head with weak carina; southern Colorado and Arizona to Panama .... *L. (N.) mexicanum*, p. 51.
10b. Head with distinct carina or none at all; Central America to Arizona 11

11a. Head with carina 12
11b. Head without carina .... *L. (Nosopus) mexicanum* group in part, p. 46.

12a. Head cylindrical, vertex flat; Arizona .... *L. (N.) acarolum* Denning, p. 47.
12b. Head shaped like WW I army helmet, vertex convex; Costa Rica .... *L. (N.) talamancense* Flint & Bueno, p. 54.

13a. Case, spiral type (Wiggins 1977: f. 8.1 G); northern California to Oregon .... *L. (N.) verodum*? Ross, p. 59.
13b. Case, turret or panel type (f. 4-6); widespread 14

14a. Case, turret type (f. 5, 6); *L. (Nosopus) unicolor* group 15
14b. Case, panel type (f. 4) 19

15a. Head light brown, vertex with pattern of darker spots; eastern, Nova Scotia and Quebec to North Carolina and Tennessee .... *L. (N.) frosti* (Milne), p. 43.
15b. Head brown, vertex unicolorous or with lighter spots; widespread, Central American, western and northeastern Alaska to Maine and Newfoundland 16

16a. Mesonotal sclerites with dark posterior margins 17
16b. Mesonotal sclerites without dark posterior margins 18

17a. Case with several long freely extended transverse plant fragments (f. 5); Northern Mexico, Arizona, and New Mexico .... *L. (N.) knulli* Ross, p. 44.
17b. Case with only short transverse plant fragments (f. 7); Guatemala, Mexico, Arizona, and southern Colorado .... *L. (N.) bakeri* Flint, p. 40.

18a. Head and notal sclerites light brown, mesonotal *sa*1 and *sa*2 sclerites do not contrast much with membranous background area; midtibia light brown with dark distal apex; California to Alaska, Rocky Mountains, Michigan to Maine and Newfoundland .... *L. (N.) cinereum* (Banks), p. 41.
18b. Head and notal sclerites dark brown, mesonotal *sa*1 and *sa*2 sclerites contrast well with membranous background area; midtibia unicolorous; California to British Columbia, Rocky Mountains, South Dakota to Quebec .... *L. (N.) unicolor* (Banks), p. 44.

19a. Length of postmentum subequal to ventral ecdysial line of adjacent genae (f. 8); case somewhat round sagittally; eastern .... *L. (N.) modestum* group, p. 35.
19b. Length of postmentum greater than ecdysial line (f. 9); case, round or square sagittally; widespread 20

20a. Case usually tapering posteriorly and sagittally square; USA and Canada exclusive of Southwest; endemic to coastal streams of Southeast, lakes and large streams of North, but exclusive of small springs .... *Lepidostoma (L.)*, p. 84.
20b. Case usually with lateral sides parallel, round or square sagittally; widespread Nearctic; endemic to springs and small mountain streams 21

21a. Western Nearctic .... *L. (Nosopus) jewetti, podagrum, roafi* groups, p. 27, 31, 33.
21b. Eastern Nearctic, including Georgia to Newfoundland, and Great Lakes region .... *L. (Nosopus) americanum* group and *L. (Mormomyia)* (except *libum* group), p. 28, 60.

Key to Adults of *Lepidostoma* Subgenera

1a. Male and female abdominal dorsum IX with paired setose warts; (f. 127, 142); eastern, usually montane .... *Mormomyia*, p. 60.
1b. Male and female with normal setae on abdominal dorsum IX; widespread 2

2a. Male phallus without parameres, phallocrypt with lateral straps (f. 175-179); female spermatheca with many conspicuous microtrichia, segregated anteriorly in small clusters, sometimes forming a reticulate pattern (f. 180-184); widespread in eastern coastal plains and northern lake regions but exclusive of Southwest USA and Central America, occasionally montane .... *Lepidostoma*, p. 84.
2b. Male phallus with parameres present but sometimes reduced to small lobes (f. 58, 71), phallocrypt without lateral straps (f. 60, 160); female spermatheca with inconspicuous microtrichia, not segregated in reticulate clusters; widespread, usually montane 3

3a. Male forewing with reflexed anterior margin and unique fold in anal region which obscures *Cu*2 and 1*A* adjacent to arculus (f. 152, 153); female sternite VIII heavily sclerotized with chalice-shaped area (f. 167); western .... *Neodinarthrum*, p. 75.
3b. Male forewing usually without reflexed anterior margin and without such fold near arculus, *Cu*2 atrophied (f. 41-53), except in *reosum* (f. 40), sometimes with anal groove or medial fold (f. 54-56); female sternite VIII without sclerotized chalice-shaped area; widespread .... *Nosopus*, p. 19.

Lepidostoma Subgenus *Nosopus* McLachlan

Nosopus McLachlan 1871:114-116, type species: *podager* McLachlan (monobasic).
Olemira Banks 1897:29, type species: *americana* Banks (monobasic); Flint 1967a:24.
Eremopsyche Banks 1901:367, type species: *frontalis* Banks (original designation); Flint 1967a:23 (as syn. of *Lepidostoma*); Fischer 1970:83.
Atomyia Banks 1905:217, type species: *modesta* Banks (original designation).
Alepomyia Banks 1908:64, type species: *bryanti* Banks (original designation).
Atomyiodes Ulmer 1911:23, f. 10-11, type species: *bispinosa* Ulmer (monobasic); Fischer 1970:70; Flint and Bueno 1977:382, *Atomyiodes bispinosus* syn. of *Olemira mexicana* Banks.
Alepomyiodes Sibley 1926:106, 190, type species: *Lepidostoma wisconsinensis* Vorhies syn. of *Alepomyia bryanti* Banks (original designation).
Arcadopsyche Banks 1930:129, type species: *prominens* Banks (monobasic).
Jenortha Milne 1936:119, 124 type species: *cascadensis* Milne (original designation).

Etymology: Greek, *nosos*, disease; *pous*, foot.

This is the most diverse subgenus of *Lepidostoma*, presently accounting for 45 species. The majority are restricted to the West, but nine species occur in the East of which two species *L. (N.) cinereum* and *unicolor* are transcontinental.

Male. Head with scape sometimes modified, but often simple and cylindrical. Maxillary palps often modified with segmentation usually obscured; generally apical segment spatulate, mesal surface concave bearing several modified petiolate scales; basal segment cylindrical. Wings with *Cu*2 of anterior wing usually atrophied (f. 41, 43-53), sometimes joining *Cu*1 basally (f. 42), or modified with setose anal groove or medial fold (f. 54-56), but complete in *L. (N.) reosum* (f. 40). *F*1, *F*2, and *F*5 (in *L. [N.] jewetti F*3) present. Arculus usually modified, distal submarginal convergence of anal veins (2*A*, 3*A* sometimes atrophied) in typical distal position only in *L. (N.) reosum*, *astaneum* and *jewetti* groups. In the other species groups of *L. (Nosopus)*, 1*A*, 2*A*, 3*A* converge with crossvein *cu-a* at arculus, forming distinct Z-shaped configuration, more basad, usually in middle of anal region. Number of anal loops variable, sometimes two present, but often anterior loop absent. Discal cell usually about as long as *F*1 and thyridial cell about 1.5 times as long as *F*1. Costal cell folding over wing, which varies in size, exhibited by some species of *L. (N.) astaneum*, *jewetti*, *americanum* and *mexicanum* groups. However, many species without costal cell. Hindwing usually not highly modified. *F*1 always present, *F*2 present only in most species of *L. (N.) mexicanum* group, *F*3, *F*4, and *F*5 absent. Unique submarginal setose groove exhibited by *L. (N.) jewetti*. Genitalia (f. 57-96) having segment X usually about as high as long in lateral view, bearing one or two apicolateral points. Phallus symmetrical, phallobase short. Parameres present but variable in size and shape. Inferior appendages generally similar to those of *L. (Mormomyia)*; first article in lateral view usually triangular and acuminate, but sometimes long and uniform in width; second article and horizontal middorsal process of first article sometimes absent as in *L. (N.) jewetti* group; basodorsal process variable, usually clavate, directed dorsally except in *L. (N.) modestum* group directed posteriorly; horizontal middorsal process parallel to first article, but absent in *L. (N.) modestum* group.

Female. Wings typical of female Lepidostomatidae. Genitalia similar to those of *L. (Mormomyia)*, but dorsum IX lacks setose warts. Spermatheca without conspicuous microtrichia. Sternite VIII rectangular with posterior margin curved outward, with several longitudinal striations indicating flexibility and position of egg pouch. Spermathecal sclerite usually oval in ventral view.

Immatures, case and habitat. Early instar larvae appear to construct stone cases only, but later instars make panel, turret, spiral, or stone cases (f. 3-6).

Most species of this subgenus are endemic to mountain streams and springs, but some species also occur in lentic environments.

Distribution. Widespread throughout North America, Panama to Alaska to Newfoundland to Georgia, especially common in mountainous regions.

Key to Adults of *L. (Nosopus)* Species
(males)

1a. Forewing with *Cu*2 complete, fused with 1*A* distally, (f. 40), small, about 4-5 mm long; Maine and New Brunswick to Massachusetts .... *reosum* Denning, p. 24.

1b. Forewing with *Cu*2 atrophied or apparently fused with *Cu*1 or 1*A* basally (f. 41-53), or with setose anal groove or medial fold (f. 54-56), about 6-11 mm long; widespread 2

2a. Forewing with *R*5 and *Ma* forming petiolate apical fork and with long setose groove traversing veins in anal region (f. 55); scape with long fingerlike mesal process (f. 36); California to Yukon to Colorado to Montana .... *cascadense* (Milne), p. 57.

2b. Forewing never with *R*5 and *Ma* forming petiolate apical fork and without setose anal groove (f. 41-53), but sometimes with short anal groove (f. 56) or with large fold along *M* (f. 54); scape without long fingerlike mesal process, but sometimes modified otherwise (f. 33, 38); widespread 3

3a. Pedicel at least twice as long as first segment of flagellum (f. 37-39); California to British Columbia to Montana 4

3b. Pedicel approximately as long as first segment of flagellum; widespread 7

4a. Forewing without deep setose fold along *M* (f. 56); scape bulbous (f. 39); California to Washington .... *verodum* Ross, p. 59.

4b. Forewing with deep setose fold along *M* (f. 54); scape not bulbous, either elbow-shaped in lateral view (f. 37) or rectangular in dorsal view (f. 38); *hoodi* group 5

5a. Scape elbow-shaped, pedicel without mesal process (f. 37); Oregon to British Columbia .... *hoodi* Ross, p. 56.

5b. Scape rectangular in dorsal view with expandable mesal bulb, pedicel with slender mesal process (f. 38) 6

6a. Segment X in lateral view with length subequal to its height (f. 94); Alberta to Montana .... *spicatum* Denning, p. 56.

6b. Segment X in lateral view about twice as long as its height (f. 92); northern California .... *ermanae* Weaver, p. 55.

7a. Forewing with arculus in its typical distal submarginal position, having anal veins joining crossvein *cu-a* adjacent to hind margin, sometimes 2*A* and 3*A* fused and 1*A* atrophied (f. 41-43) 8

7b. Forewing with arculus modified, slightly more basad of its typical distal position, having anal veins joining crossvein *cu-a* in middle of anal region (f. 44-53) 11

8a. Forewing without any anal loops, 2*A* and 3*A* apparently fused, having 1*A* atrophied, hence appearing to have only one complete vein in anal field reaching arculus (f. 41); parameres blunt, short, about a fourth as long as phalicata (f. 58, 59); *astaneum* group 9

8b. Forewing with anal veins forming one large anal loop by fusing just before arculus (f. 42, 43); parameres long, about 0.7 times as long as phalicata (f. 60, 61); *jewetti* group 10

9a. Segment X in lateral view with posterolateral process bearing three dorsal points (f. 59) .... *recinum* Denning, p. 26.
9b. Segment X in lateral view with posterolateral rounded apical lobe (f. 58) .... *astaneum* Denning, p. 25.

10a. Inferior appendage in lateral view with long slender horizontal process (f. 60); hindwing with setose submarginal anal groove (f. 42); California to British Columbia .... *jewetti* Ross, p. 27.
10b. Inferior appendage in lateral view with short, stout, horizontal process (f. 61); hindwing without setose groove (f. 43); California .... *licolum* Denning, p. 27.

11a. Maxillary palps with flexible apical segment bearing many long petiolate scales; frons concave and vertex projected forward like visor (f. 31); eastern; *americanum* group 12
11b. Maxillary palps not flexible, usually spatulate or triangulate with small scales mesad, frons not concave and vertex not extended forward like visor; widespread 15

12a. Forewing with broad costal fold, when folded concealing *Sc, R, Rs* medially, and bearing many short scales (f. 44) 13
12b. Forewing without broad costal fold (f. 45) 14

13a. Segment X in lateral view with two long terminal points, both directed posterodorsad (f. 62); Georgia to Quebec .... *americanum* (Banks), p. 28.
13b. Segment X in lateral view with two short terminal points, dorsal point directed anterodorsad and ventral point directed posterodorsad (f. 64); Virginia to Quebec to Minnesota .... *costale* (Banks), p. 30.

14a. Phalicata bulbous mesially; segment X in lateral view with long curved ventral process (f. 65); Massachusetts to Quebec to Newfoundland .... *prominens* (Banks), p. 31.
14b. Phalicata not bulbous mesially; segment X in lateral view without long curved ventral process (f. 63); Georgia and Tennessee to Newfoundland and Minnesota .... *bryanti* (Banks), p. 29.

15a. Forewing with two anal loops (f. 45); western; *podagrum* group 16
15b. Forewing with one anal loop (f. 46-53); widespread 17

16a. Foreleg basotarsus broad, modified, bearing many long petiolate setae anteriad; labial palps also broadened (f. 29); California to Alberta .... *podagrum* McLachlan, p. 31.
16b. Foreleg and labial palps unmodified, normal (f. 30); Oregon to British Columbia to Idaho .... *quercinum* Ross, p. 31.

17a. Inferior appendage in lateral view with capitate, basodorsal process at least as long as and parallel to main article, without horizontal middorsal process; parameres membranous, lobiform (f. 69-73); eastern; *modestum* group 18
17b. Inferior appendage in lateral view with basodorsal process directed vertically, shorter than and not parallel to main article, with horizontal middorsal process; parameres sclerotized, spiniform (f. 74-91); widespread 23

18a. Segment X with long lateral processes (f. 72); South Carolina to Newfoundland .... *ontario* Ross, p. 37.
18b. Segment X without lateral processes (f. 71) 19

19a. Segment X in dorsal view with 3/4 of mesal processes fused basad (f. 70); Georgia to Newfoundland .... *lydia* Ross, p. 36.
19b. Segment X in dorsal view with half or less of mesal processes fused basad (f. 73) 20

20a. Segment X in lateral view tapering gradually to blunt apical process (f. 73); North Carolina to Newfoundland .... *pictile* (Banks), p. 38.
20b. Segment X in lateral view tapering abruptly to slender apical processes (f. 69) 21

21a. Segment X in dorsal view with apical arms slender, parallel, straight and directed posteriad (f. 71); North Carolina and Tennessee to Quebec .... *modestum* (Banks), p. 37.
21b. Segment X in dorsal view with apical arms not slender, parallel nor straight, but bent with apices directed posteriomesad (f. 69) 22

22a. Segment X in dorsal view with lateral margins of distal arms obliquely angled mesad; apices pointed and almost touching (f. 69); Tennessee .... *compressum* Etnier & Way, p. 36.
22b. Segment X in dorsal view with lateral margins of distal arms gradually curved mesad; apices rounded and widely separated (Harris 1986: f. 4); Alabama .... *weaveri* Harris, p. 39.

23a. Inferior appendage in lateral view with robust thumblike basodorsal process extended posteriad about as far as main process (f. 74-78); widespread; *unicolor* group 24
23b. Inferior appendage in lateral view with less robust basodorsal process, not extended posteriad as far as main process (f. 68, 79-91); western; *mexicanum* and *roafi* groups 28

24a. Scape with small mesal process, bearing retractable ball within membranous lobe (f. 33); posterior margin of segment X in lateral view without acute or square notch (f. 74, 75) 26
24b. Scape without mesal process (f. 34); posterior margin of segment X in lateral view with acute or square notch (f. 76, 78) 25

25a. Posterior margin of segment X in lateral view with acute notch (f. 78); California to British Columbia to Minnesota to Quebec.. *unicolor* (Banks), p. 44.
25b. Posterior margin of segment X in lateral view with square notch (f. 76); North Carolina to Nova Scotia .... *frosti* (Milne), p. 43.

26a. Inferior appendage with pointed apical process (f. 74); Colorado to Mexico to Guatemala .... *bakeri* Flint, p. 40.
26b. Inferior appendage with two aligned disk-shaped apical processes (f. 75, 77) 27

27a. Segment X in lateral view with oblique dorsal margin, an acute apex and with many large tubercles (f. 77); northern Mexico, Arizona, and New Mexico .... *knulli* Ross, p. 44.
27b. Segment X in lateral view with curved dorsal margin, small rounded apical lobe and with few small tubercles (f. 75); California to Alaska to Maine and Newfoundland .... *cinereum* (Banks), p. 41.

28a. Hindwing with *R* four-branched (f. 48-50) 29
28b. Hindwing with *R* five-branched (f. 51-53); *mexicanum* group (in part) 33

29a. Segment X in lateral view with two long posterior projections 30
29b. Segment X not as above 31

30a. Inferior appendage without basodorsal process (Bueno and Contreras 1986: f. 7); Oaxaca .... *dafila* Bueno & Contreras, p. 48.
30b. Inferior appendage with basodorsal process (Bueno and Contreras 1986: f. 1); Oaxaca .... *oaxacense* Bueno & Contreras, p. 52.

31a. Segment X in lateral view with two blunt posterior projections (f. 81); Chiapas .... *delongi* Ross, p. 48.
31b. Segment X in lateral view with only one acute posterior projection (f. 68, 79) 32

32a. Segment X in lateral view with medial apex (f. 68); New Mexico to Alaska to Montana to Colorado .... *roafi* (Milne), p. 34.
32b. Segment X in lateral view with ventral apex (f. 79); Arizona .... *acarolum* Denning, p. 47.

33a. Inferior appendage in lateral view with venter truncated apically and narrow apicodorsal process extending posteriorly (f. 83, 86) 34
33b. Inferior appendage in lateral view without venter truncated apically and narrow apicodorsal process extending posteriorly (f. 82, 85, 87-91) 35

34a. Forewing with narrow anterior margin reflexed over apices of *Sc*, *R*1, *R*2 and *R*3 (f. 51); maxillary palps spatulate; Veracruz .... *frontale* (Banks), p. 49.
34b. Forewing without reflexed anterior margin; maxillary palps triangular (f. 35); Panama to Arizona and southwestern Colorado .... *mexicanum* (Banks), p. 51.

35a. Inferior appendage in lateral view with serrated subapical ectal flange, bearing 2-25 teeth (f. 80, 84, 85, 88, 90) 36
35b. Inferior appendage in lateral view without subapical ectal flange, or with flange not serrated (f. 82, 87, 89) 40

36a. Subapical flange of inferior appendage semicircular with 6-25 teeth (f. 84, 85, 90) 37
36b. Subapical flange of inferior appendage not semicircular with two or three teeth (f. 80, 88) 39

37a. Subapical flange of inferior appendage with six big teeth (f. 85); anterior wing without costal cell basad (f. 53); Arizona to Durango and Sinaloa .... *lacinatum* Flint, p. 50.
37b. Subapical flange of inferior appendage with 10-25 small teeth (f. 84, 90); anterior wing with costal cell basad (f. 52) 38

38a. Segment X in lateral view small portion of main process hangs below posteroventral process (f. 84); Guatemala .... *heveli* Flint & Bueno, p. 49.
38b. Segment X in lateral view no portion of main process hanging below posteroventral process (f. 90); El Salvador .... *steinhauseri* Flint & Bueno, p. 53.

39a. Segment X with two dorsal processes in lateral view; inferior appendage with hatchet-shaped apex (f. 80); Morelos and Veracruz .... *aztecum* Flint & Bueno, p. 47.
39b. Segment X without two dorsal processes in lateral view; inferior appendage with truncated apex (f. 88); Durango .... *rectangulare* Flint, p. 53.

40a. Segment X in lateral view with three broad posterior lobes (f. 91); Costa Rica .... *talamancense* Flint & Bueno, p. 54.
40b. Segment X in lateral view without three rounded posterior lobes (f. 82, 87, 89) 41

41a. Segment X with posterior margin serrated (f. 82) 42
41b. Segment X with posterior margin not serrated (f. 87, 89) 43

42a. Inferior appendage with semicircular subapical ectal flange, parameres broad (f. 82); Chiapas .... *denningi* Weaver, p. 49.
42b. Inferior appendage without subapical ectal flange, parameres slender (Bueno and Contreras 1986: f. 4-6); Nuevo León .... *leonilae* Bueno & Contreras, p. 50.

43a. Segment X with many tubercles; inferior appendage without ventral subapical flange (f. 89); Costa Rica .... *reimoseri* Flint & Bueno, p. 53.
43b. Segment X with only two or three apical tubercles in lateral view; inferior appendage with distinct ventral subapical flange in lateral view (f. 87); Mexico State .... *quila* Bueno & Padilla, p. 52.

Lepidostoma (Nosopus) Reosum Group

This group consists of a single species, *L. (N.) reosum*, of which only the adult male is known. Male wing venation unique (f. 40). Forewing with *Cu*2 running parallel to 1*A* and both veins fusing distad, forming long narrow cell; 2*A* and 3*A* fused medially forming only one anal cell and terminating in posterior margin together; distal convergence of veins at arculus similar to that of *Theliopsyche*. Hindwing with *F*1 and *F*5, *M* unbranched; 1*A* and 2*A* fused basally, forming small anal cell, and then terminating in posterior margin together.

Lepidostoma (Nosopus) reosum Denning
(f. 40, 57)

Lepidostoma reosa Denning 1954:192, f. 6A-C (male); Fischer 1970:63; Neves 1979:171.

Male. Scape not highly modified, cylindrical, 0.3 mm long. Maxillary palp fingerlike, 0.2 mm long. Wings (f. 40) with anterior wing 4.3 mm long, brown. Genitalia (f. 57) with segment IX short, dorsum slightly longer than venter in lateral view. Segment X in lateral view lobe-shaped, basal height about twice its length, apex slightly extended posteriorly beyond inferior appendages, with three stout dorsoapical spines; in dorsal view with two straight fingerlike processes half its length, and pair of short lateral processes basally. Inferior appendages in lateral view with first article triangular; basodorsal process long, directed vertically fingerlike; middorsal process horizontal, half as long as basodorsal process; second article short, subapical mesal process.

Female, immatures, case and habitat. Unknown. However, larvae may inhabit bog areas where adults have been collected.

Life history. Recorded flight dates: 22 May - 14 June.

Distribution. Maine, Massachusetts, New Brunswick.

Type data. Denning (1954): "*Holotype* male, Belchertown, Massachusetts, May 21, 1938, (from University of Massachusetts Collection)." See type material examined below.

Material examined. Holotype male, (DGD). MAINE: Kennebec Co: Mt. Vernon, 2 males, 7 VI 1963, AE Brower, "Flitting like *Micropteryx* over tiny bog pools," (USNM); Augusta, 2 males, 22 V 1941, AE Brower, (USNM). NEW BRUNSWICK: Kent Co: Kouchibouguac Natl Pk, male, 14 VI 1978, DB Lyons, (CNCI).

Lepidostoma (Nosopus) Astaneum Group

This group comprises two species, *L. (N.) astaneum* and *recinum*.

Male. Head (f. 27) with scape cylindrical, unmodified. Maxillary palps apparently two-segmented, segmentation obscured, apical segment slightly longer than basal segment. Wings (f. 41) having anterior wing with small costal cell; *F*1, *F*2, and *F*5 present; discal cell long and narrow; thyridial cell long; 1*A* and *Cu*2 atrophied basally; 2*A* and 3*A* apparently fused completely and merging with crossvein *cu-a* near hind margin, distal submarginal configuration of veins at arculus present. Posterior wing with *F*1 and *F*5; *M* unbranched; 1*A* and 2*A* terminating in hind margin separately. Genitalia (f. 58, 59) generally similar to those of other species of *L. (Nosopus)*. Phallus with parameres short and blunt, about a fourth as long as phalicata, phallotremal sclerite relatively large. Inferior appendage in lateral view with first article triangular and acuminate; second article, subapical mesal lobe pointed posteriorly; basodorsal process directed vertically, slightly shorter than middorsal process; horizontal middorsal process parallel to first article.

Female. Genitalia similar to those of many species of *L. (Nosopus)*.

Immatures, case and habitat. The pupae and probable larvae of *recinum* were examined. These specimens were collected from spring and temporary pool areas. Larval cases cylindrical and composed of small stones.

Distribution. Species of this group are known to occur in northern California and Oregon.

Lepidostoma (Nosopus) astaneum Denning
(f. 41, 58)

Lepidostoma astanea Denning 1954:190-192, f. 5A (male); Fischer 1970:38, 39.
Lepidostoma goedeni Denning 1971:208, f. 6-6B (male) NEW SYNONYM; Anderson 1976:119.

Male. Scape cylindrical, 0.8 mm long. Maxillary palps 0.6 mm long, with many scales on mesal surface. Wings (f. 41) brown. Anterior wing 6.3 mm long. Genitalia (f. 58) similar to those of *L. (N.) recinum*, but having segment X with posterolateral process a rounded apical lobe in lateral view.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 14 June - 24 August.

Distribution. Northwestern California and western Oregon.

Type data. *Lepidostoma astanea* Denning (1954): "*Holotype* male, Patrick Creek, Del Norte County, California, June 24, 1951, D. G. Denning." See type material examined below.

Lepidostoma goedeni Denning (1971): "*Holotype* male, Beverly Beach, Lincoln County, Oregon, 2 August 1969, blacklight trap, Kenneth Goeden." See type material examined below.

Material examined. Holotypes of *astaneum* and *goedeni* (DGD). OREGON: Lincoln Co: Flynn Cr, 2 males, 19 VII 1982; male, 6 VIII 1982; 3 males, 18 VIII

1982, RWW, (OSUO); Big Elk River, 1 mi N of Harlan, male, 24 VIII 1982, RWW, (OSUO).

Lepidostoma (Nosopus) recinum Denning
(f. 27, 59, 97)

Lepidostoma recina Denning 1954:188-189, f. 2A-B (male); Fischer 1970:63; Anderson 1976:122; Anderson et al. 1982:14.
Lepidostoma calensis Denning 1968:68, f. 6-6B (male) NEW SYNONYM; Anderson 1976:118; Wisseman and Anderson 1984:459.

Male. Head (f. 27) with scape cylindrical, 1.1 mm long, and maxillary palp 0.5 mm long. Anterior wing 6.3 mm long, brown. Genitalia (f. 59) similar to those of *L. (N.) astaneum*, but having segment X with posterolateral process bearing three dorsal points in lateral view.

Female. Genitalia illustrations (f. 97) based on examination of developed pupa.

Immatures, case and habitat. Several pupal cases examined indicate that late instar larvae construct cylindrical cases of stones approximately 9.5 mm long, 2.0 mm wide and slightly curved. The collection label of pupae examined reads: "clogging water supply from covered spring." Also, larvae inhabit temporary pools.

Life history. Larvae collected 19 January to 27 April, prepupae late April. Recorded flight dates: 29 June - 24 August.

Distribution. Central California to Oregon.

Type data. *Lepidostoma recina* Denning (1954): "*Holotype* male, Peavine Ridge, McMinnville, Oregon, June 29, 1950, K. M. Fender." See type material examined below.

Lepidostoma calensis Denning (1968): "*Holotype*. Male. Strawberry, Tuolumne County, California, 13 August 1960, D. Q. Cavagnaro. Type to be deposited in the Academy of Sciences, Golden Gate Park, San Francisco, California." See type material examined below.

Material examined. Holotypes of *recinum* and *calensis* (DGD). CALIFORNIA: Siskiyou Co: Preston Peak, 2000', camp at bridge, male, AB Gurney, (USNM). **OREGON**: Benton Co: Marys Peak, road 12-7-30.1, temporary pool, larvae & prepupae 27 IV 1983 (7 males & 11 females reared, emerged late V-early VI), RWW, (OSUO); Lincoln Co: Flynn Cr, larvae? 19 I 1982 (male pupa reared); male, 19 VII 1982; 2 males, 24 VIII 1982, RWW, (OSUO); Polk Co: Falls City, 21 VIII 1967, 8 male pupae, female pupa, (ROME).

Lepidostoma (Nosopus) Jewetti Group

This group contains only two species, *L. (N.) jewetti* and *licolum*.

Male. Head (f. 28) with scape cylindrical. Maxillary palps slender and fingerlike. Wings (f. 42, 43) having anterior wing with distal arculus and small costal cell basad, only one very long anal cell present. Posterior wing with *F*1 only, anal veins separate. Genitalia (f. 60, 61) having sternite VIII with a conspicuous patch of setae. Segment X in lateral view about twice as long as high, and about as long as inferior appendage. Phallus heavily sclerotized about 0.7 times as long as phalicata. Inferior appendage long with first article long and fingerlike; second article absent; dorsal process vertical and slender; horizontal middorsal process, parallel to first article.

Female. Female of only *L. (N.) jewetti* known, genitalia (f. 98).

Immatures, case and habitat. Final instars of *L. (N.) jewetti* build panel cases; immatures collected at springs.

Distribution. Species of this group are indigenous to the Pacific Coastal region.

Lepidostoma (Nosopus) jewetti Ross
(f. 42, 60, 98)

Lepidostoma jewetti Ross 1946:269, 285-286, f. 16, 16C (male); Fischer 1970:58; Anderson 1976:119; Nimmo and Scudder 1978:120; Webb 1980:97; Nimmo and Scudder 1983:80.

Male. Scape cylindrical, 0.9 mm long. Maxillary palp fingerlike, 0.9 mm long. Wings (f. 42) brown. Anterior wing about 9.3 mm long; venation unique, being more complete than most male lepidostomatids, with *F*1, *F*2, *F*3 and *F*5, but only one anal cell, *Cu*2 fused with *Cu*1 basad, and 1*A* atrophied basad. Posterior wing with *F*1 only, and with unique subapical marginal setose groove. Genitalia (f. 60) having inferior appendage with long, slender, horizontal, middorsal process and basodorsal process half as long.

Female. Genitalia (f. 98) having segment IX with short blunt anterolateral apodeme and dorsum with several transverse grooves. Spermathecal sclerite oval in ventral view and narrow in lateral view.

Immatures, case and habitat. Glenn Wiggins has provided several identified immature specimens of *L. (N.) jewetti*, which show that this species may be indigenous to spring habitats and that final larval instars construct panel cases.

Life history. Larvae collected 14 April, pupae 22 May. Recorded flight dates: 15 May - 25 September.

Distribution. California, British Columbia, Oregon, and Washington.

Type data. Ross (1946): "*Holotype*, male. - Ellsworth, Washington, May 15, 1941, S. Jewett, Jr." Holotype at the INHS (Webb 1980). See type material examined below.

Material examined. Holotype male, (INHS). **CALIFORNIA:** Tehama Co: Dead Mule Spring, by Covelo Road 2 mi N of Pashenta, 5150', 4 males, 6 females, 28 VIII 1972, HBL, (CASC). **OREGON:** Benton Co: Marys Peak, spring along road at Chintimini Cr, larvae, 14 April 1964, (male and 2 females reared), NHA & GBW, (ROME); Lincoln Co: Newport, male, 12 VII 1968, B Brown, (OSUO); Flynn Cr, male pupa, 22 V 1982; male, 14 IX 1982, RWW, (OSUO).

Lepidostoma (Nosopus) licolum Denning
(f. 28, 43, 61)

Lepidostoma licola Denning 1975:325-326, f. 7-7D (male).

Male. Head (f. 28) with scape cylindrical, 1.2 mm long. Maxillary palps slender fingerlike, 0.5 mm long. Wings (f. 43) brown. Anterior wing, about 7.0 mm long, venation less complete than that of *L. (N.) jewetti*, with *F*1, *F*2, and *F*5, and *Cu*2 atrophied basally. Genitalia (f. 61) having segment X in lateral view with small midventral notch adjacent to small protrusion. Phallus with phalicata gradually curved. Inferior appendage similar to that of *L. (N.) jewetti*, but with basodorsal process shorter.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight date: 9 July.

Distribution. Northeastern California. Only known from the type locality.

Type data. Denning (1975): "*Holotype* male. - Sierra County, California, Yuba Pass, 6700', 9 July 1967. *Paratypes*, three males, same data as for holotype. Types to be deposited in Academy of Sciences, Golden Gate Park, San Francisco, California." See type material examined below.

Material examined. Three male paratypes (DGD), (of which a paratype was kindly given to me by Dr. Denning).

Lepidostoma (Nosopus) Americanum Group

This species comprises four eastern species, *L. (N.) americanum, costale, bryanti*, and *prominens*.

Male. Head unique (f. 31) with vertex projected anteriorly between eyes like small visor, forming concave frontal area. Scape cylindrical, slightly longer than head. Maxillary palp having flexible apical segment with many petiolate scales and held before concave area of frons. Wings (f. 44) with venation as in *L. (N.) podagrum*. Anterior wing with *F*1, *F*2, and *F*5 and usually both anal cells, veins of arculus converging mesad, sometimes modified with large costal cell as in *L. (N.) americanum* or *costale*, or with small costal cell basad as in *L. (N.) prominens*. Posterior wing similar to that of *L. (N.) podagrum* with *F*1 present, 1*A* and 2*A* apparently completely fused. Genitalia (f. 62-65) with segment IX relatively shorter than that of *L. (N.) jewetti* group. Segment X about as long as high with two apical points in lateral view. Phallus short, except in *L. (N.) prominens*. Inferior appendage with first article triangular and acuminate.

Female. Genitalia (f. 99-102) of *L. (N.) americanum* and *bryanti* similar to those of females of *L. (Nosopus) unicolor* group. Spermathecal sclerite broad in lateral view and oval in ventral view, but in *L. (N.) costale* and *prominens* with oval, lateral flanges in ventral view.

Immatures, case and habitat. Final instars construct panel cases, square in cross section. Immatures show preference to inhabit small streams, rather than springs.

Distribution. The four species of the *L. (Nosopus) americanum* group are indigenous to eastern North America.

Lepidostoma (Nosopus) americanum (Banks)
(f. 12, 31, 44, 62, 99)

Olemira americana Banks 1897:29 (male).
Lepidostoma americanum: Flint and Wiggins 1961:295, f. 13A-B (female); Blickle and Morse 1966:11; Fischer 1970:38; Hilsenhoff 1975:25; Wray 1967:56; Roy and Harper 1975:1084; Roy and Harper 1979:162; Etnier and Schuster 1979:19; Neves 1979:171; Mingo and Gibbs 1980:45; Parker and Voshell 1981:6; Unzicker et al. 1982:9.106, 9.107; Lake 1984:221.
Lepidostoma americana: Seward and Swegman 1979:24.
[*Mormonia pictilis* Banks removed from this synonymy.]

Male. Head (f. 31). Scape cylindrical, 1.0 mm long. Maxillary palps flexible bearing many petiolate scales and with segmentation obscured, 1.5-2.0 mm long. Wings (f. 44) brown. Anterior wing similar to that of *L. (N.) costale* with large costal cell bearing many scales (f. 12). Genitalia (f. 62). Similar to those of *L. (N.) costale* having segment X in lateral view with long narrow dorsal point parallel to shorter ventral point, both directed posterodorsally.

Female. Genitalia (f. 99) having spermathecal sclerite somewhat rectangular, with posterior lobe, in lateral view; oval and slightly acuminate anteriorly, without lateral flanges, in ventral view .

Immatures, case and habitat. Late instars construct panel cases with hexagonal pieces of bark and wood. Pupae collected from small streams.

Life history. Pupae collected in late July. Recorded flight dates: 15 June - 13 August.

Distribution. Delaware, Georgia, Maine, Massachusetts, New Hampshire, New York, North Carolina, Pennsylvania, Quebec, South Carolina, and Virginia. Report from Manitoba (Ross 1946) by Banks is in error (Flint and Wiggins 1961).

Type data. Banks (1897): "One male, several females, Sea Cliff, N.Y., July."

Olemira americana Banks, *New Lectotype*, male: Sea Cliff, L.I., New York. MCZC Type 11700.

Material examined. **GEORGIA**: Union Co: Wolf Cr, 3.5 mi N of Neel Gap, male, 7 VII 1945, PW Fattig, (INHS). **MASSACHUSETTS**: Hampshire Co: Williamsburg, E branch near Ashfield Road, male pupa, 25 VII 1967, Merrill, (ROME). **NEW HAMPSHIRE**: Coos Co: Fabayan, male, 3 VIII 1958, OSF, (USNM). **NORTH CAROLINA**: Jackson Co: 5 km SE of Balsam, 4 males, 3 females, 9-12 VII 1974, (USNM); Whitewater Falls, male, 10 females, 14 VII 1979, JCM, (CUCC). **PENNSYLVANIA**: Fayette Co: Bear Run, male, 6 VII 1978, BG Swegman, (USNM); Fulton Co: Crystal Spring, Chestnut Bridge Hollow, male, 1 VII 1977, JSW, (JSW); Aughwick Cr, male, female, 30 VI 1977, JSW, (JSW); Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, 18 males, 140 females, 16 VII-13 VIII 1975, JSW & JLS, (JSW). **SOUTH CAROLINA**: Pickens Co: Carrick Creek, Table Rock St Pk, male, 5 VII 1969, PHC, (CUCC). **VIRGINIA**: Fauquier Co: Burtons Br., Jackson Hollow, 7 males, female, OSF, (USNM); Spotsylvania Co: 2 males, 15 VI 1974, B Strickler, (USNM).

Lepidostoma (Nosopus) bryanti (Banks)
(f. 63, 90)

Alepomyia bryanti Banks 1908:65, pl. 2, f. 12, 13 (male).
Lepidostoma wisconsinensis Vorhies 1909:685-687, f. 9, pl. 52 f. 8, pl 57 f. 1-10.
Lepidostoma bryanti: Ellis 1962:5, 14; Etnier 1965:151; Blickle and Morse 1966:11; Fischer 1970:39; Hilsenhoff et al. 1972:22, 28; Longridge and Hilsenhoff 1973:181; Hilsenhoff 1975:25; Karl and Hilsenhoff 1979:33, 39-40; Neves 1979:171; Roy and Harper 1979:162; Hilsenhoff 1981:31; Parker and Voshell 1981:6; LaFontaine 1981:249, 251; Marshall and Larson 1982:78-79, f. 155; Krueger and Cook 1984:1482; Singh et al. 1984:226; Steven and Hilsenhoff 1984:165.
Lepidostoma wisconsinense: Fischer 1970:69.

Male. Head and its appendages similar to those of *L. (N.) americanum*. Scape 0.6 mm long. Anterior wing brown, about 7.3 mm long, without costal cell, venation same as that of *L. (N.) podagrum*. Genitalia (f. 63) having segment X in lateral view with two small subequal apical hooks directed dorsad.

Female. Genitalia (f. 90). Spermathecal sclerite similar to that of *L. (N.) americanum*, in ventral and lateral view somewhat oval.

Immatures, case and habitat. Karl and Hilsenhoff (1979) observed many larvae inhabiting Glen Creek, Wisconsin. They also remarked that the larvae construct panel cases similar to those of *L. (Mormomyia) griseum*.

Life history. Larvae collected from November to late June; pupae from 5 May to 1 June. Recorded flight dates: 20 May - 7 September.

Distribution. Georgia, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, Newfoundland, New York, North Carolina, Nova Scotia, Ontario, Pennsylvania, Quebec, Rhode Island, Tennessee, Virginia, and Wisconsin.

Type data. *Alepomyia bryanti* Banks (1908): "Four males from Grand Lake, Newfoundland." Ross (1938b): "*Lectotype*, male. - Grand Lake Newfoundland, July 28, 1906, O. Bryant. No. 11709." I have seen that the lectotype and one other male syntype are at the MCZC.

Lepidostoma wisconsinensis Vorhies (1909): "These larvae are quite plentiful in the streams at Devil's Lake and Parfrey's Glen, where they inhabit the pools. The pupae were abundant at the Glen on June 1. They could be found only among roots and grasses where these hung in the stream, as, for example, in a bit of overhanging sod. I have not taken the imagos in their natural habitat. Those reared in the laboratory appeared in the first days of June." *New Lectotype*, Dane County, Wisconsin, 7 VI 1907, C. T. Vorhies. MCZC Type 11688.

Material examined. GEORGIA: Union Co: Vogel St Pk, Wolf Cr, male, 6 females, 30-31 V 1980, JCM, (CUCC). MAINE: Aroostook Co: Oxbow, 8-9 VII 1961, A Brower, (USNM). NORTH CAROLINA: Macon Co: Highlands, 5 males, 8 females, 3-8 VI 1961, OSF, (USNM). PENNSYLVANIA: Forest Co: Kellettville, Ross Run, 18-19 VI 1976, JSW, (JSW); Lancaster Co: Welsh Mountains, New Holland Watershed Area, male, female, 4-5 VI 1977, JSW, (JSW); Sommerset Co: Kooser St Pk, Kooser Run, 20 males, 56 females, 7-8 VI 1976, JSW & JLS, (JSW); Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, male, 20 VII 1977, JLS & JSW, (JSW). RHODE ISLAND: Washington Co: Richmond, male, 20 VI 1971, AG Lavallee, (CUCC). VIRGINIA: Grayson Co: Fox Cr, 1.7 mi W of Troutdale, male, 2 females, CM & OSF, (USNM).

Lepidostoma (Nosopus) costale (Banks)
(f. 64, 91)

Olemira costalis Banks 1914:265, pl. 10 f. 34 (male).

Lepidostoma costalis: Ellis 1962:5, 14; Etnier 1965:151; Blickle and Morse 1966:11; Longridge and Hilsenhoff 1973:180; Hilsenhoff 1975:25; Karl and Hilsenhoff 1979:33, 40; Masteller and Flint 1979:169, 174; Neves 1979:171; Mingo and Gibbs 1980:46; Hilsenhoff 1981:31; LaFontaine 1981:249, 251; Lake 1984:221; Steven and Hilsenhoff 1984:165.

Lepidostoma costale: Fischer 1970:41; Roy and Harper 1975:1084; Roy and Harper 1979:162; Swegman et al. 1981:131, 144.

Male. Head and its appendages like those of *L. (N.) americanum*. Scape 1.0 mm long. Maxillary palp 0.7-0.8 mm long. Anterior wing brown, with large costal cell, like *L. (N.) americanum*. Genitalia (f. 64) similar to those of *L. (N.) americanum*, but segment X in lateral view with two short apical points perpendicular and subequal to each other, dorsal point directed anterodorsad, ventral point directed posterodorsad.

Female. Genitalia (f. 91) with spermathecal sclerite similar to that of *L. (N.) prominens* being nearly round and with pair of round lateral flanges in ventral view.

Immatures, case and habitat. Larva and case undescribed, but Karl and Hilsenhoff (1979) reported that many larvae and pupae were found at Glen Creek, Wisconsin.

Life history. Larvae collected from mid-August to late June; pupae from 24 July to 5 August. Recorded flight dates: 26 May - 9 September.

Distribution. Connecticut, Delaware, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Ontario, Pennsylvania, Quebec, Virginia, and Wisconsin.

Type data. Banks (1914): "From Woodworth's Lake, Fulton Co., N.Y., 19 August (Alexander)." Ross (1938b): "*Lectotype*, male. - Woodworth's Lake, Fulton Co., New York, August 19, 1909. No. 11701. *Allotype*, female. - Same data." I have seen these specimens at the MCZC; only the lectotype bears a MCZC type-label.

Material examined. CONNECTICUT: Litchfield Co: Canaan, Music Mt, male, 31 VIII 1962, SW Hitchock, (USNM). PENNSYLVANIA: Crawford Co: Linesville Cr, 2 males, 6 VIII 1973, Walker, (USNM); Forest Co: Pigeon, Marienville Rod & Gun Club, 15 males, 28-29 VII, JSW, (JSW).

Lepidostoma (Nosopus) prominens (Banks)
(f. 65, 92)

Arcadopsyche prominens Banks 1930:129, pl. 7 f. 1, 8, 10 (male)
Lepidostoma prominens: Fischer 1970:62; Roy and Harper 1975:1085; Williams and Williams 1979:2407; Roy and Harper 1979:163; Neves 1979:171.

Male. Head and its appendages similar to those of *L. (N.) americanum*. Scape 1.1 mm long. Maxillary palps 1.4 mm long. Anterior wing 9 mm long, venation similar to that of *L. (N.) bryanti*, but with only one anal cell and small costal cell basad. Genitalia (f. 65) similar to those of *L. (N.) bryanti*, but segment X in lateral view with long curved ventral point and shorter apical point.

Female. Genitalia (f. 92) with spermathecal sclerite in ventral view oval, similar to that of *L. (N.) costale*.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 3 June - 19 August.

Distribution. Massachusetts, New Hampshire, Newfoundland (Labrador), Nova Scotia, and Quebec.

Type data. Banks (1930): "From Cape North, Cape Breton, Nova Scotia, 7 August." Ross (1938b): "*Lectotype*, male. - Cape North, Cape Berton Island, Nova Scotia, August 7, 1928. No. 16321. *Lectoallotype*, female. - Same data." I have seen these lectotypes and three additional male syntypes at the MCZC. One male syntype is at the INHS (pers. comm. J. D. Unzicker).

Material examined. **NEWFOUNDLAND:** Labrador, Goose Bay, 4 males, 2 females, 31 July 1950, JJ Tibbles, (CNCI). **NEW HAMPSHIRE:** Coos Co: Mt. Washington, Cutler River, male, 4-5 VIII 1958, OSF, (USNM). **QUEBEC:** Parc des Laurentides, Grand Lac Jacques Cartier, male, female, 8 VIII 1938, Vladyhoff, (INHS).

Lepidostoma (Nosopus) Podagrum Group

This group comprises two species, *L. (N.) podagrum* and *quercinum*.

Male. Scape cylindrical unmodified. Maxillary palps slender and fingerlike. The two species of this group have nearly identical male genitalia, and are best distinguished on the bases of unique secondary sexual modifications of the labial palps and anterior leg, exhibited only in *L. (N.) podagrum* (f. 29). Wings (f. 45) with anterior wing similar to that of *L. (N.) bryanti*, with *F*1, *F*2, and *F*5, *Cu*2 atrophied, two anal cells present, without costal cell or other modifications. Posterior wing with *F*1; 1*A* and 2*A* completely fused. Genitalia (f. 66, 67) with segment X about as long as high, triangular, in lateral view. Phallus short, similar to that of *L. (N.) bryanti*.

Female. Genitalia (f. 93, 94) having segment IX with blunt dorsal subapical lobe in lateral view. Spermathecal sclerite in ventral view oval, slightly pointed anteriorly and posteriorly, about twice as long as wide.

Immatures, case and habitat. Final instar larvae construct panel cases, square sagittally. Immatures inhabit mountain streams.

Distribution. The two species of the *L. (N.) podagrum* group are endemic to the Pacific Northwest.

Lepidostoma (Nosopus) podagrum (McLachlan)
(f. 29, 45, 66, 93)

Nosopus podager McLachlan 1871:116, pl. 2 f. 6 (male).
Lepidostoma podager: Fischer 1970:61-62; Newell and Potter 1973:20; Anderson 1976:120; Baumann and Unzicker 1981:27; Anderson et al. 1982:14; Roemhild 1982:11; Ruiter and Lavigne 1985:43.

This was the first Lepidostomatid discovered in the New World. Contrary to the general rule that lepidostomatid males have modified antennal scapes and maxillary palps (or they have no modified appendages), *L. (N.) podagrum* is an exception, having modified labial palps and anterior legs instead. This may possibly be the result of a homeotic mutation, as the expression of the genes which usually cause modifications of the antennal and maxillary somites of the head has shifted posteriorly.

Male. Head and prothorax as in (f. 29). Scape 1.1 mm long, cylindrical. Maxillary palp 0.8 mm long, fingerlike, slender. Labial palp 1.8 mm long, more robust than that of female. Anterior leg with enlarged tibia, dilated basotarsus bearing many petiolate scales. Wings (f. 45) brown. Anterior wing 8.5 mm long. Genitalia (f. 66) similar to those of *L. (N.) quercinum*.

Female. Head and prothorax (f. 29). Wings (f. 45). Genitalia (f. 93) similar to those of *L. (N.) quercinum*.

Immatures, case and habitat. Final instar larvae construct panel cases square in cross section with irregular square pieces of bark and wood. They inhabit small streams in pool areas. Pupae found in decayed wood.

Life history. Larvae collected 8 to 11 November, pupae 20 March. Recorded flight dates: 4 February - 17 September.

Distribution. Alberta, California, Idaho, Montana, Oregon, Utah and Wyoming.

Type data. McLachlan (1871) as cited by Kimmins and Denning (1951): "California: (H. Edwards) 1 male. Type mounted as a microscope preparation." Dr. P. C. Barnard (pers. comm.) has confirmed that the unique type is in the British Museum (Nat. Hist.). I have seen that there is a male at the MCZC labeled "Type 10941 Sierra Nev Cal" and there is another male labeled as a type at the INHS (pers. comm. J. D. Unzicker), however neither specimen has type-status.

Material examined. ALBERTA: Carrot Cr, old Hwy 16, 92 males, 15 females, 4 VI 1976, APN, (UASM); Chickadee Cr, Hwy 43, W of Whitecourt, male, 1 VII 1967, APN, (UASM); House River, Hwy 63, 2 males, 32 females, 29 VI 1978, APN, (UASM); Lobstick River, Hwy 16, Niton Junction, 5 males, 3 females, 4 VI 1976, APN, (UASM); Rourke Cr, Hwy 44, S of Smith, 5 males, 9 females, 6 VI 1976, APN, (UASM); Smulland Cr, Forestry Trunk Road, 47 mi S of Goodwin, male, 26 females, 2 VII 1967, APN, (UASM); Two Cr, Hwy 43, W of Whitecourt, 7 males, 1 VII 1967, APN, (UASM). CALIFORNIA: Contra Costa Co: Mt. Diavlo, male, 20 II 1954, SW Hitchock, (USNM); El Dorado Co: Fallen Leaf Lake, 4 males, 20 VI 1961, 6 males, 20 VI 1961, SDS, (UICM); River between Fallen Leaf & Tohoe Lakes, 3 males, 3 females, 22 VI 1961, SDS, (UICM); Marin Co: Lagonitas Cr, 0.5 mi W of Jewell, 40', larvae in pools on vegetation & roots 11 XI 1982 (adults reared), LES, (LES); Monterey Co: Big Sur River, 2 males, 2 females, 1 VI 1961, SDS, (UICM); Santa Clara Co: Guadalupe Cr, male, 20 III 1960, SDS, (UICM); Coyote Cr, 2 males, 2 females, 4 II 1961, SDS, (UICM); Uvus Cr, male, 20 IV 1960, SDS, (USNM). IDAHO: Teton Co: 2 mi W of Tetonia, Teton River, 17 males, female, 14 VI 1969, SDS, (JSW). MONTANA: Gallatin Co: Bozeman, Bozeman Cr, 6 males, 2 females, 16 VI 1986, DLG, (JSW). OREGON: Harney Co: Pueblo Mt, Cottonwood Cr, male, 29 V 1925, SGJ, (USNM); Josephine Co: Grayback St Pk, 12 mi E of Cave Junction, 3 males, 2 females, 13 VI 1963, NHA, (OSUO); Lane Co: Lookout Cr, 6 mi NE of Blue River, final instars 8 XI 1976 (preserved as pupae 11 I 1977), NHA & Frost, (ROME); 12 mi SE of Eugene, male, 17 IX 1966, KG, (OSUO); Lincoln Co: Flynn Cr, pupae burrowed in punky wood, 20 III 1981 (male & 4 females emerged 13 IV); 9 males, female, 19 V 1982, RWW, (OSUO).

Lepidostoma (Nosopus) quercinum Ross
(f. 30, 67, 94)

Lepidostoma quercina Ross 1938a:176-177, f. 119 (female); Anderson and Wold 1972:192, 197; Anderson 1976:120-121; Grafius and Anderson 1979: 433-441; Nimmo and Scudder 1978:120; Webb 1980:98; LaFontaine 1981:249; Dudley and Anderson 1982:10; Roemhild 1982:11; Nimmo and Scudder 1983:80.
Lepidostoma quercinum: Fischer 1970:62.

Male. Head (f. 30) with scape cylindrical, 1.0 mm long. Maxillary palp 0.8 mm long, fingerlike. Labial palp 1.5 mm long, about as slender as maxillary palp. Anterior leg unmodified. Wings brown, venation similar to that of *L. (N.) podagrum*. Anterior wing 8.3 mm long. Genitalia (f. 67) indistinguishable from those of *L. (N.) podagrum*.

Female. Genitalia (f. 94) similar to those of *L. (N.) podagrum*.

Immatures Cases and Habitat. Contributions to the bionomics of *L. quercinum* have been presented by Anderson and Wold (1972), Anderson (1976), and Grafius and Anderson (1979). These studies reveal that larvae of this species inhabit small streams and that final instars construct panel cases similar to those of *L. (N.) podagrum*.

Life history. Larvae were collected from August to February; pupae from January to February. Recorded flight dates: 21 March - 2 September.

Distribution. British Columbia, Idaho, Montana, Oregon and Washington.

Type data. Ross (1938a): "*Holotype*, male. - Corvallis, Oregon: April 2, 1935, Oak Creek." Holotype at the INHS (Webb 1980).

Material examined. **IDAHO**: Shoshone Co: Emeral Cr, male, 26 V 1962, SDS, (SDS). **OREGON**: Benton Co: Camp Adair, male, 15 V 1965, SGJ, (USNM); 9 mi N of Corvallis, Berry Cr, 5 males, 19 IV 1967, ED Evans, (USNM); ibid, 3 males, 14 IV 1973, NHA, (OSUO); 3 males, 13 IV 1980; 6 males, 3 females, 20 VI 1982, RWW, (OSUO); Corvallis, Oregon St Univ, Oak Cr, 5 males, 4 females, 17-22 IV 1969, C Kerst, (USNM); Lobster Cr, camp 15 mi SW of Alsea, larva, pupa, 4 VIII 1974 (emerged 15-21 VIII), NHA, (ROME); 5.5 mi S of Philomath, Rock Cr, Hwy 34, 2 males, 21 V 1970, E Evans, (OSUO); Clatsop Co: E Humbug Cr, male, 9 V 1965, SGJ, (USNM); Nehalem R at Red Bluff Rd, 4 mi NE of Elsie, male, 8 V 1965; male, 23 IV 1966; SGJ, (USNM); Lincoln Co: Deer Cr, 2 males, 24-28 V 1974, RWW, (OSUO); Flynn Cr, 3 males, female, 4-5 V 1982; 4 males, 21 V 1982, RWW, (OSUO); 1 mi N Harlan, Big Elk Cr, male, 24 VIII 1982; 3 males, 2 IX 1982, RWW, (OSUO); Union Co: 20 mi SW of La Grande, Ladd Cr, 3 males, 13-21 VI 1978, SDS, (SDS); male, 21 VI 1978, SDS, (JSW). **WASHINGTON**: Grays Harbor Co: 25 mi N Hoquiam, Donkey Cr, male, 18 V 1973, SDS, (SDS).

Lepidostoma (Nosopus) Roafi Group

This group comprises only one species, *L. (N.) roafi*.

Male. Wings (f. 48) similar to those of *L. (N.) unicolor*. Genitalia (f. 68) with segment X short. Phalicata and parameres short. Inferior appendages with first article acuminate, basodorsal process short; second article acuminate, directed posteriorly.

Female. Genitalia of *L. (N.) roafi* (f. 95) with spermathecal sclerite similar to that of *L. (N.) cascadense* in lateral view.

Immatures, case and habitat. The final instar larvae of *L. (N.) roafi* construct panel cases.

Distribution. Western North America.

Lepidostoma (Nosopus) roafi (Milne)
(f. 48, 68, 95)

Atomyia roafi Milne 1936:120, 121, 124 (male).
Lepidostoma roafi: Fischer 1970:63-64; Anderson and Wold 1972:192, 197-198; Newell and Potter 1973:20; Anderson 1976:122; Ellis 1978:203, 204; Nimmo and Scudder 1978:120; LaFontaine 1981:251; Roemhild 1982:11; Baumann and Unzicker 1981:27; Anderson et al. 1982:14; Nimmo and Scudder 1983:80; Anderson et al. 1984:15, 17, 18; Nimmo and Wickstrom 1984:4; Ruiter and Lavigne 1985:43; Herrmann et al. 1986:435; Nimmo 1986a:2.

Male. Scape 0.8 mm long, not highly modified. Maxillary palps slender, spatulate. Wings (f. 48) with venation similar to that of *L. (N.) unicolor*. Anterior wing about 7.7 mm long, not highly modified. Genitalia (f. 68) similar to those of *L. (N.) verodum*. Segment X about 2/3 as long as inferior appendage, dorsum and venter curved together forming blunt posterior apex in lateral view. Phalicata short, about half as long as parameres. Inferior appendage with vertical basodorsal process about half as long as horizontal middorsal process, first article acuminate, middorsal process extending to base of second article.

Female. Genitalia (f. 95) having spermathecal sclerite with height greater than length in lateral view.

Immatures, case and habitat. Final instar larvae construct panel cases. Larvae inhabit small streams in pool areas, pupae found attached to wood.

Life history. Larvae collected 8 July to 20 August; pupae early July to 15 September. Recorded flight dates: 28 May - 19 October.

Distribution. Alaska, Alberta, British Columbia, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, and Yukon.

Type data. Milne (1936): "*Holotype* male 'Eagle Co. (Sheephorn, 7900'), 11-VIII, C. F. Clagg', 1 male *paratype* 'Horseshoe R. section (Grand Co., 8500'), Colo., 18-VIII' in the M.C.Z.; fourteen other males from B.C., Ore., 28-V to 19-X, 3 in the Can. Nat. collection, 11 in the author's collection." I have seen the holotype and three paratypes, one male and two females at the MCZC. A male and female paratype are at the INHS (pers. comm. J. D. Unzicker).

Material examined. **ALASKA**: Prince of Wales Isl, Red Lake, male, 13 IX 1951, B Malkin, (CASC); Trapper Cr, Hwy 3, 2 males, 2 females, 2 VIII 1979, APN, (UASM). **ALBERTA**: Cold Cr, Hwy 16, Nojack, 2 males, female, 24 VII 1977, APN, (UASM); Ernst Cr, Maycroft-Gap Rd, 3 males, female, 31 VII 1976, APN, (UASM); Lusk Cr, Forestry Trunk Road, Kananaskis, male, 1 VIII 1976, APN, (UICM); Moose Cr, Forestry Trunk Road, S of Clearwater River, 3 males, 2 females, 17 VII 1976, APN, (UASM); Red Deer River, Crossing, Forestry Trunk Road, 2 males, 6 VIII 1976, APN, (UASM). **BRITISH COLUMBIA**: U BC Exp Forest, Spring Cr, 2 males, 19 VIII 1981, K. Van Frankenhuyzen, (OSUO); ibid, Maythy Cr, near Haney, 8 males, 13-15 VIII 1986, JS Richardson, (JSW). **CALIFORNIA**: Fresno Co: Dinkey Cr, 2 males, 10 IX 1983, RD Haines, (DGD); Sonoma Co: Fairfield, Osborn Preserve, Copeland Cr, 1540', larvae in pools 20 VIII 1980 (adults reared), LES, (LES). **IDAHO**: Blaine Co: Ketchum, 2 males, 27 VIII 1978, RFS, (JSW); Butte Co: Craters Moon Natl Monument, 3 males, 3 females, 12 VIII 1965, DS Horning, (SDS); Franklin Co: Cub River Canyon, male pupa, 23 VIII 1973, GF Knowlton, (USNM); Shoshone Co: Mullan, Willow Cr, male, 22 VIII 1950, JAR & HHR, (USNM). **MONTANA**: Lake Co: Yellow Bay State Pk, Yellow Bay Cr, male, 6 IX 1968, RWB, (USNM); Missoula Co: Rattlesnake Camp, male, 16 IX 1968, RWB, (USNM). **NEVADA**: Washoe Co: Galena Cr, male, 31 VII 1968, RWB, (USNM). **OREGON**: Baker Co: Spring Cr, male, female, 25 IX 1967, JHB, (USNM); Benton Co: 7 mi NW of Corvallis, male, 5 females, 3-10 IX 1969, CD Kerst, (USNM); Clatsop Co: Vic Gronnel Rd, 2 mi E of Elsie, male, 16-17 VII 1965, SGJ, (USNM); Crook Co: Ochoco Mts, Hwy 26, near Summit, 2 males, 31 VII 1965, SGJ, (USNM); Lane Co: Mack Cr, HJ Andrews

Forest, 11 mi NE of Blue River, 4 larvae, 8 VII 1976 (reared to male, 2 females, male pupa preserved 19 VIII), NHA, (ROME); HJ Andrews Exp For, Mack Cr, male emerged, 28 VIII 1973, (OSUO); ibid, 2 male pupae, 15 IX 1977, L Roberts, (OSUO); ibid, Lookout Cr, male, female, 25 VIII 1982, RWW, (OSUO); Linn Co: Quartzville Rd, Loan Star Bridge, 8 larvae?, 3 VIII 1974 (plus 4 adults, emerged 5-15 VIII), NHA, (OSUO); Quartzville Rd, 2.5 mi E Rocky Top Bridge, immatures, 26 VI 1973 (male pupa & female, emerged IX), NHA, (OSUO); Lincoln Co: Flynn Cr, male, female, 30 VIII-6 IX 1962, (OSUO): ibid, 5th instar larvae (2 pupae, 4 males, 4 females emerged early VII 1981), RWW, (OSUO); ibid, attached to wood, prepupae & pupae 19 VIII 1981 (male & 8 females emerged 23 VIII-mid IX), RWW, (OSUO); Union Co: Big Cr, 7 mi E of Medical Springs, males & females, 15 VIII-5 IX 1975, SDS, (SDS); Goose Cr, 15 mi E of Medical Springs, 2 males, 22 VIII 1975, SDS, (SDS); Lick Cr, 6 mi E of Medical Springs, males & females, 15 VII-5 IX 1975, SDS, (SDS); Velvet Cr, 8 mi E of Medical Springs, males & females, 22 VII-18 IX 1975, SDS, (SDS); Jordan Cr, 20 mi SW of La Grange, males & females, 18 VIII-18 IX 1975, SDS, (SDS). **UTAH**: Summit Co: Trail Lake, Trail Camp, male, 20 VIII 1973, RWB, (USNM); Uinta Mts, Hayder Fork of Bear R., male, 4 VIII 1978, RFS, (JSW). **WASHINGTON**: King Co: Hull Cr, 8 mi E of North Bend, male, 2 females, 11 IX 1980, SDS, (SDS); Kittitas Co: 5 mi NE of Ellesburg, 15 males, 4 females, 19 X 1968, SDS, (SDS); Gale Cr, Kachess, male, 25 VIII 1970, SDS, (SDS); 2 mi N of Little Kachess Lake, 2 males, 2 females, 10 VIII 1971, SDS, (JSW); 17 mi N of Roslyn, Cle Elum River, 4 males, 8 IX 1968, SDS, (SDS); Lewis Co: 11 mi S of Randle, 1300', Camp Cr, 2 males, 8-10 IX 1980, DRG & SDS, (SDS); Whatcom Co: Glacier, Gallup Cr, 2 males, 8 IX 1970, SDS, (SDS). **WYOMING**: Yellowstone Natl Pk, Virginia Meadows, Gibbons River Br, male, 31 VIII 1940, THF & THF Jr, (USNM); Shoshone Natl Forest, Crazy Cr, 2 males, 2 females, 25 VIII 1955, KM Fender, (USNM). **YUKON**: Judas Cr, Alaska Hwy, 110.4 km W of Teslin Bridge, male, female, 24 VII 1979, APN, (UASM).

Lepidostoma (Nosopus) Modestum Group

This group comprises six species, *L. (N.) compressum, lydia, modestum, ontario, pictile*, and *weaveri*. The adults and immatures appear to be slightly smaller than most other eastern species of *Lepidostoma*.

Male. Head (f. 32) with scape not highly modified, cylindrical. Maxillary palp with apical segment broader than basal segment, mesal surface concave bearing several long scales, segmentation obscured. Wings (f. 46) with venation similar to that of *L. (N.) podagrum* group, but anterior wing with only one anal cell and hindwing with 1*A* and 2*A* not completely fused. Genitalia (f. 69-73) with segment X usually long and narrow, about 0.75 times as long as inferior appendages. Phallus short. Parameres, lightly sclerotized flexible lobes. Inferior appendage, without middorsal process; first article, long and fingerlike; second article, subapical mesal lobe; basodorsal process capitate, parallel to and not shorter than first article.

Female. Wings (f. 46) with venation typical of female lepidostomatids. Genitalia (f. 96-99) having sternite VIII with anterior lateral margins heavily sclerotized and mesoposterior region lightly sclerotized, forming genital pouch. Spermathecal sclerite in ventral view bell-shaped, being widest anteriorly.

Immatures, case and habitat. Larval head dark brown with length of postmentum about equal to that of midventral ecdysial line (f. 8), being shorter than that of other known larvae of *Lepidostoma*. Final instars construct cigar-shaped, panel cases (f. 4), with hexagonal pieces of leaf. Identified larvae of *L. (N.) lydia* and *ontario* found in mountain springs suggest that other species of this group may be endemic to similar habitats.

Distribution. The species of the *L. (N.) modestum* group are indigenous to eastern North America, being particularly common throughout the Appalachian Mountains.

Lepidostoma (Nosopus) compressum Etnier & Way
(f. 69)

Lepidostoma compressa Etnier and Way 1973:428-429, f. 5A-C (male); Etnier and Schuster 1979:29.
Lepidostoma compressum: Unzicker et al. 1982:9.107.

Male. Scape, maxillary palps and wings similar to those of *L. (N.) modestum*. Genitalia (f. 69) with segment X in lateral view similar to *L. (N.) modestum*, but in dorsal view similar to *L. (N.) pictile* and *weaveri*. Apex of phalicata curved ventrad.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight date: 23 May.

Distribution. Tennessee.

Type data. Etnier and Way (1973): "*Holotype*, male. - Plateau Experiment Station, Cumberland Co., Tenn., 23 May 1970, Univ. Tenn. Dept. Ag. Biol. staff. *Paratypes*. - Same data as for holotype, 28 April 1967, 2 males. The holotype has been deposited at the U.S. National Museum. A paratype has been deposited at the University of Georgia. The remaining paratype is in the senior author's collection." The first mentioned paratype is now at the INHS (pers. comm. J. D. Unzicker), the other is mentioned below.

Material examined. Paratype male, (ECUT).

Lepidostoma (Nosopus) lydia Ross
(f. 70, 96)

Lepidostoma lydia Ross 1939:70, pl. 10, f. 9-9B (male, female); McConnochie and Likens 1969:150; Fischer 1970:59; Roy and Harper 1975:1085; Etnier and Schuster 1979:19; Roy and Harper 1979:162; Neves 1979:171; Webb 1980:97; Parker and Voshell 1981:6; Unzicker et al. 1982:9.106, 9.107.

Male. Scape, maxillary palps and wings similar to those of *L. (N.) modestum*. Genitalia (f. 70) with segment X in lateral view similar to that of *L. (N.) pictile*, but with shallow mesoapical notch in dorsal view. Phallus with apex of phalicata curved ventrad.

Female. Genitalia (f. 96) having segment IX with short blunt apodeme. Spermathecal sclerite in ventral view similar to that of *L. (N.) ontario*; in lateral view similar to that of *L. (N.) modestum*, but somewhat larger and without membranous-like dorsal mass.

Immatures, case and habitat. Immatures appear to be endemic to springbrooks. Final instars construct cigar-shaped panel cases, which are round sagittally and composed of hexagonal pieces of leaf similar to that of *L. (N.) ontario*.

Life history. Larvae collected February and August; pupae 23 February to 19 June. Recorded flight dates: 20 April - 6 September.

Distribution. Georgia, Massachusetts, Newfoundland, New Hampshire, New York, North Carolina, Nova Scotia, Pennsylvania, Quebec, South Carolina, Tennessee, and Virginia.

Type data. Ross (1939): "*Holotype*, male. - Lydia, Va., April 20, 1938, Ross & Burks. *Allotype*, female. - Same data. *Paratypes*. - Same data, 18 males." Holotype at the INHS (Webb 1980). Other type material at the INHS (pers. comm. J. D. Unzicker).

Material examined. **GEORGIA**: Union Co: Vogel St Pk, Wolf Cr, 4 males, 22 females, 30-31 V 1980, JCM, (CUCC). **NEWFOUNDLAND**: Big Falls, male, 28 VI 1966, DR Smith, (USNM). **NEW HAMPSHIRE**: Coos Co: Mt Washington, Jefferson Notch Rd, male, 7-8 VII 1977, JSW, (JSW); ibid, Pinkhams Notch, Cutler River, 15 males, 8-9 VII 1977, JSW, (JSW). **NORTH CAROLINA**: Macon Co:

Standing Indian Cpg, Kimsey Cr, 4 males, 2 females, 13 V 1977, JCM, (CUCC); Wayah Bald at hairpin turn, 20 V 1970, OSF, (USNM); Yancey Co: Mt. Mitchell, Camp Alice, male, 9 VI 1961, OSF, (USNM). **PENNSYLVANIA**: Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, 3 larva, male pupa, 23 II 1976; 3 male pupae, 7 pupae, 6 V 1975; pupa, 19 VI 1975; 2 larvae, 14 VIII 1975, JSW & JLS, (JSW). **TENNESSEE**: Sevier Co: 10.2 mi E of Gatlinburg, 7 males, female, 20 V 1970, OSF, (USNM). **VIRGINIA**: Shenandoah Natl Pk, Skyline Drive, mile post 79.5, male, 20 V 1961, OSF, (USNM); Shenandoah Natl Pk, Hogcamp Brk, male, 22-23 V 1970, OSF, (USNM); Madison Co: tributary of Hughes River, N of Nethers, male, 6 V 1973, OSF, (USNM); Rockingham Co: Hone Quarry Cpg, male pupa, 5 larvae, 29 IV 1967, OSF, (USNM).

Lepidostoma (Nosopus) modestum (Banks)
(f. 32, 46, 71, 97)

Atomyia modesta Banks 1905:217.
Lepidostoma modestum: Wray 1967:56; Fischer 1970:60; Etnier and Way 1973:429, f. 6A-C (male); Roy and Harper 1975:1085; Etnier and Schuster 1979:19; Roy and Harper 1979:162; Unzicker et al. 1982:9.106, 9.107.

Male. Head (f. 32) with scape cylindrical, unmodified, 0.4 mm long. Maxillary palps 0.4 mm long, fingerlike with mesoapical portion concave and bearing many petiolate scales. Wings (f. 46) dark brown. Forewing without costal cell or setose grooves, venation similar to that of *L. (N.) unicolor* group. Genitalia (f. 71) with segment X similar to that of *L. (N.) compressum* in lateral view, but with long narrow pair of fingerlike mesoapical processes, in dorsal view.

Female. Wings (f. 46) typical of lepidostomatid females. Genitalia (f. 97) with spermathecal sclerite in ventral view similar to that of *L. (N.) ontario*, in lateral view somewhat like that of *L. (N.) lydia*, but with more massive, irregular dorsum.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 13 May - 18 August.

Distribution. New Hampshire, North Carolina, Quebec, Tennessee, and Virginia.

Type data. Banks (1905): "Many specimens from Black Mountains, North Carolina, May and June (Beutenmüller)." Ross (1938b): "*Lectotype*, male. - Black Mts., North Carolina, May. No. 11702." I have seen the lectotype and one other male syntype at the MCZC. A male syntype is at the INHS (pers. comm. J. D. Unzicker).

Material examined. **NORTH CAROLINA**: Macon Co: Standing Indian Cpg, Nantahala River, 26 males, 35 females, 13 V 1977, JCM, (CUCC). **VIRGINIA**: Rappahannock Co: Shenandoah Natl Pk, Piney River, male, 28 V 1977, OSF, (USNM).

Lepidostoma (Nosopus) ontario Ross
(f. 4, 8, 72, 98)

Lepidostoma ontario Ross 1941:119-120, pl. 13 f. 98-98A (male, female); Blickle and Morse 1966:11; Wray 1967:56; Fischer 1970:60-61; Roy and Harper 1975:1085; Etnier and Schuster 1979:19; Roy and Harper 1979:163; Neves 1979:171; Webb 1980:98; Unzicker et al. 1982:9.106, 9.107.

Male. Scape, maxillary palp and wings similar to those of *L. (N.) modestum*. Genitalia (f. 72) having segment X unique with pair of ventrolateral processes which extend posteriorly beyond mesal processes.

Female. Genitalia (f. 98) having segment IX in lateral view with long attenuated apodeme. Spermathecal sclerite in ventral view similar to that of *L. (N.) pictile*.

Immatures, case and habitat. Larval head venter (f. 8). Larvae appear to be endemic to mountain springs and final instars construct cigar-shaped, panel cases (f. 4).

Life history. Larvae and pupae collected 18 April 1981. Recorded flight dates: 18 April - 24 August.

Distribution. Maine, Massachusetts, Newfoundland, New Hampshire, North Carolina, Nova Scotia, Ontario, Quebec, South Carolina, Tennessee, and Virginia.

Type data. Ross (1941): "*Holotype*. - Male; Costello Lake, Algonquin Park, Ontario, Ontario Fisheries Research Laboratory; May 29, 1938; (W. M. Sprules; station #2). *Allotype*. - female; same data as for holotype; [INHS]. *Paratypes*. - 2 males, 2 females; Randolph, New Hampshire; June 25, 1930. 3 males; same data as for holotype, but May 30, 1938: 1 female; May 31: 1 male; May 26. Paratypes are in the collections of the Illinois Natural History Survey, the Museum of Comparative Zoology, and The Academy of Natural Sciences of Philadelphia." Holotype at the INHS (Webb 1980). I have seen 3 paratypes, 1 male and 2 females, at the MCZC, Type 25863.

Material examined. **NEWFOUNDLAND:** Lewisporte near Notre Dame Bay, 2 males, 12 VII 1961, CPA, (USNM). **NEW HAMPSHIRE:** Coos Co: Mt. Washington, Jefferson Notch Road, Mt. Pleasant Brook, male, 4 females, 9 VII 1977, JSW, (JSW); ibid, Abenaki Brook, 3 males, female, 7-8 VII 1977, JSW, (JSW). **NORTH CAROLINA:** Blue Ridge Parkway, Crabtree Meadows, male, 5-6 VI 1962, EG MacLeod, (USNM); Macon Co: Highlands, male, 3-8 VI 1961, OSF, (USNM); Wayah Bald, male pupae, 8 VI 1961, OSF, (USNM); Wayah Bald, stream at hairpin turn, 2 males, 8 females, 20 V 1970, OSF, (USNM); Wayah Crest Cpg, 3 males, 30-31 V 1981, JSW & RWH, (JSW); Wayah Bald, Rattlesnake Spring, 5 larvae, 4 pupae, 18 IV 1981 (4 males, female emerged same day); 3 males, 3 females, 30-31 V 1981, JSW & RWH, (JSW); Jackson Co: Whitewater Falls, Whitewater River, male, 6 V 1975, PHC, (CUCC); Yancey Co: Black Mts, 4760', Hemphill Spring, 2 males, female, 1-2 VII 1979, JSW, (JSW). **SOUTH CAROLINA:** Oconee Co: Wash Branch above Crane Cr, Tamassee Rd 0.4 mi E of Hwy 107, male, 3 females, 24 IV-15 V 1983, JSW & PJS, (JSW); Pickens Co: Wildcat Cr, 5 mi NW of Clemson, 4 males, 7 females, 17-21 IV 1968, PHC, (CUCC). **VIRGINIA:** Shenandoah Natl Pk, White Oak Canyon, male, 27 V 1962, OSF, (USNM).

Lepidostoma (Nosopus) pictile (Banks)
(f. 73, 99)

Mormonia pictilis Banks 1899:211 [removed from synonymy of *Lepidostoma americanum* (Banks)].

Lepidostoma swannanoa Ross 1939:69-70, pl. 10 f. 11-11A (male, female) NEW SYNONYM; Wiggins 1961:702; Wray 1967:56, 57; McConnochie and Likens 1969:150; Fischer 1970:65; Roy and Harper 1975:1085; Etnier and Schuster 1979:20; Williams and Williams 1979:2407, 2410; Neves 1979:171; Roy and Harper 1979:163; Mingo and Gibbs 1980:46; Webb 1980:98; Parker and Voshell 1981:6; Unzicker et al. 1982:9.106, 9.107; Marshall and Larson 1982:78, f. 153.

New male and female associations of several species of the *L. (N.) modestum* group revealed that *L. (N.) pictile* (previously known only from the female holotype) is the senior synonym of *L. swannanoa* (which was based on the unique characteristics of the male).

Male. Scape, maxillary palp and wings similar to those of *L. (N.) modestum*. Genitalia (f. 73) with segment X similar to that of *L. (N.) lydia* in lateral view; but with two acuminate processes bearing serrate lateral margins, separated by long narrow gap, in dorsal view.

Female. Genitalia (f. 99) having segment IX with short blunt apodeme in lateral view. Spermathecal sclerite in lateral view similar to that of *L. (N.) ontario*, being short in length and elongated in height.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 21 April - 1 August.

Distribution. Maine, Massachusetts, New Hampshire, Newfoundland, New York, North Carolina, Nova Scotia, Quebec, Tennessee, Virginia, and West Virginia.

Type data. *Mormonia pictilis* Banks (1899): "Franconia, New Hampshire (Mrs. A. T. Slosson)." *New Lectotype*, female: Franconia, New Hampshire, MCZC Type 11699.

Lepidostoma swannanoa Ross (1939): "*Holotype*, male. - Black Mountain, N.C., April 24, 1938, North Fork Swannanoa River, Ross & Burks. *Allotype*, female. - Same data. *Paratypes*. - Same data, 2 males." Holotype at the INHS (Webb 1980). Allotype and paratype at the INHS (pers. comm. J. D. Unzicker). See type material examined below.

Material examined. Lectotype female of *M. pictilis*, (MCZC); allotype female of *L. swannanoa*, (INHS). **NEWFOUNDLAND:** Big Falls, 26 VI 1966, DR Smith, (USNM); Aspen Brk Cpg, male, 14 July 1961, CPA, (USNM). 28 **NEW HAMPSHIRE:** Coos Co: Groveton, male, 9 VI 1973, WJ Kief, (USNM). **NEW YORK:** Allegany St Pk, 7 males/females, V-3 VI 1963, WW Wirth, (USNM). **NORTH CAROLINA:** Swain Co: Great Smoky Mts Natl Pk, Smokemont Cpg, 3 males, 3 females, 12 V 1970, OSF, (USNM). **MASSACHUSETTS:** Hampshire Co: Cummington, woodland spring, 3 males, 4 VI 1973, AB Gurney, (USNM). **RHODE ISLAND:** Washington Co: Richmond, male, 20 VI 1971, AC Lavallee, (CUCC). **VIRGINIA:** Bath Co: Blowing Springs, Black River, male, 16 V 1975, OSF, (USNM); Blowing Springs, camp 8 mi W of Warm Springs, 57 males, 69 females, 18-29 V 1963, Field & OSF, (USNM); Douthat St Pk, 2 males, 3 females (immatures in II) emerged 15 IV 1973, B. Stieckler, (USNM). **WEST VIRGINIA:** Tucker Co: Red Cr, near Laneville, male, 26 V 1973, OSF, (USNM).

Lepidostoma (Nosopus) weaveri Harris

Lepidostoma weaveri Harris 1986:36-38, f. 4A-G (male, female).

This species is closely related to *L. (N.) pictile* and especially *L. (N.) compressum*. It differs from *L. (N.) pictile* by having male segment X in lateral view tapering abruptly into a slender apical arm. Also, it differs from *L. (N.) compressum* by having segment X in dorsal view with lateral margins of distal arms gradually curved mesad, with their apices rounded and widely separated.

Male. Color brown. Anterior wing 7.0 mm long. Venation similar to *L. (N.) modestum*. Scape cylindrical, 0.5 mm long, and maxillary palp, 0.7 mm long, both similarly modified in *L. (N.) modestum*. Genitalia: Segment X in lateral view with dorsum curved ventrad toward subapex, venter almost horizontal, and slender apical arm curved slightly and directed posteriodorsad; in dorsal view comprising two mesal processes, having basal third fused together, lateral margins parallel and straight, and apical arms acuminate and curved slightly mesad. Inferior appendage similar to that in *L. (N.) compressum*, but having apex of main ventral process broader and more rounded.

Female. Color brown. Anterior wing 7.0 mm long. Scape cylindrical 0.6 mm long. Genitalia having dorsum of segment IX and spermathecal sclerite similar to that of *L. (N.) pictile*.

Immatures, case and habitat. According to Harris (1986) the larva has postmentum and larval case characteristic of the *L. (N.) modestum* group, and inhabit several small, spring-flowing, temporary streams.

Life history. Final instar larvae collected in February and March. Recorded flight dates: 13-19 March.

Distribution. The Cumberland Plateau of Alabama. Only known from the type localities.

Type data. Harris (1986): "*Holotype* male. - Alabama, Tuscaloosa County, unnamed tributary to Tyro Creek at bridge 303, 4.5 miles east New Lexington (R10W, T17S, S15), 12 March 1984, S. Harris (USNM). *Paratypes*. - Alabama, same as above, 7 males, 2 females (USNM, INHS, UA), same, but 14 March 1984, 2 males, 4 females (USNM, INHS, FSCA), same, but 15 March 1984, 3 males, 10 females (USNM, INHS, UA, ROM), same, but 13 March 1984, 3 males, 2 females, same but 19 March 1982, 1 male, unnamed tributary to Wallace Branch, 5 miles southeast Berry (R10W, T17S, S2), 15 March 1984, S. Harris, 3 males, 1 female (USNM, INHS)." See type material examined below.

Material examined. Paratypes: male, 19 III 1982, SCH, (SCH); male and female, 13 March 1984, SCH, (JSW). I wish to thank Steven C. Harris for kindly giving me the latter paratypes.

Lepidostoma (Nosopus) Unicolor Group

This group comprises five known species, *L. (N.) bakeri, cinereum, frosti, knulli*, and *unicolor*.

Male. Head (f. 34). Scape not highly modified in *L. (N.) frosti* and *unicolor*, but in *L. (N.) bakeri, cinereum* and *knulli* having retractable spherical mesal process (f. 33). Maxillary palps and wings (f. 47) similar to those of *L. (N.) modestum* group. Genitalia (f. 74-78) having inferior appendage unique, with large thumblike basodorsal process extending posteriorly about as far as apex of first article, first article which is short and broad in lateral view, second article small subapical rounded lobe, horizontal middorsal process present.

Female. Genitalia (f. 110-114) similar to those of several other members of *L. (Nosopus)*, such as *bryanti* and *americanum*. Wings (f. 47). Spermathecal sclerite in ventral view oval, elongated longitudinally.

Immatures, case and habitat. The larvae of all five species of this group have been observed. Final instar larvae of the *L. (N.) unicolor* group construct a turret case (f. 5, 6). However, one series of final instar larvae of *L. (N.) cinereum* with stone cases only. The turret case consists of several transverse plant fragments arranged in a random whorl about the exterior, resembling the turret of a lycosid spiders. Anderson (1976) referred to this larval case as the "log-cabin type."

Distribution. Two species, *L. (N.) cinereum* and *unicolor* have transcontinental distributions, occurring throughout western and northeastern North America; *L. (N.) frosti* is strictly eastern; *L. (N.) bakeri* and *knulli* are endemic to the Southwest.

Lepidostoma (Nosopus) bakeri Flint
(f. 74, 110)

Lepidostoma bakeri Flint 1965:175, f. 10A-B (male); Flint 1967c:175; Denning 1968:68-69, f. 7-7C; Flint and Bueno 1977. p. 377, 378-380.

Male. Scape with small spherical retractable mesal process, similar to that of *L. (N.) cinereum*. Maxillary palp, 1.1 mm long. Wings brown. Anterior wing about 8.0 mm long. Genitalia (f. 74) with segment X similar to those of *L. (N.) cinereum* and *knulli*, but first article of inferior appendage with small hooked apex.

Female. Genitalia (f. 110) similar to those of other species of *L. (N.) unicolor* group. Segment IX in lateral view with attenuated anterior apodeme curved ventrad. Spermathecal sclerite oval in ventral view, elongated longitudinally.

Immatures, case and habitat. Final instar larva head light brown with few lateral muscle scars. Mesonotum also light brown with posterior margin black, similar to that of *L. (N.) knulli*. Hind leg with many long setae. Case consists of small transverse plant fragments, similar to that of *L. (N.) frosti* and *unicolor*.

Life history. Larvae and pupae collected in July. Recorded flight dates: 11 April - 8 September.

Distribution. Arizona, Colorado, Mexico, and Guatemala.

Type data. Flint (1965): "*Holotype*, male: Arizona, Portal, Southwest Research Station, 16 June 1963, J. H. Baker. United States National Museum type 67417. *Paratype*, male: same data."

Material examined. **ARIZONA**: Cochise Co: Southwestern Research Station, 5 mi SW of Portal, male paratype, 16 VI 1963, JHB, (USNM); males & females, 11 IV-21 VII 1965, (USNM); 6 males, 10 females, 1-8 IX 1974, H & MT, (CUCC). **COLORADO**: Jackson Co: Gould, 2 males, 2 females, 4 VIII 1974, H & MT, (CUCC). **MEXICO**: La Marquesa, La Cruces Natl Pk, many larvae, 5-9 VII, OSF & Ortiz, (USNM); **VERACRUZ**: La Joya Rt. 140, Km 307, male pupa, many larvae, 21 VII 1965, OSF & Ortiz, (USNM).

Lepidostoma (Nosopus) cinereum (Banks)
(f. 33, 75, 111)

Silo cinereus Banks 1899:210-211.
Lepidostoma cinereum: Fischer 1970:40-41.
Lepidostoma strophis Ross 1938a:177, f. 120 (male) NEW SYNONYM; Ellis 1962:5, 14; Fischer 1970:65; Newell and Potter 1973:20; Hilsenhoff 1975:25; Anderson 1976:122; Nimmo and Scudder 1978:120; Roy and Harper 1979. p. 163; Webb 1980:98; Hilsenhoff 1981:31; LaFontaine 1981:251; Baumann and Unzicker 1981:27; Roemhild 1982:11; Marshall and Larson 1982:79, f. 156; Nimmo and Scudder 1983:80; Nimmo and Wickstrom 1984:4; Herrmann et al. 1986:435; Nimmo 1986a:2; Nimmo 1986b:96; McElravy and Resh 1987:85, 88.
Lepidostoma strophe: Unzicker et al. 1982:9.107.

The male and female associations of this species and its known distribution, suggests that *L. strophe* (based on the male type) is a junior synonym of *L. (N.) cinereum* (previously known only from the female holotype).

Male. Scape (f. 33) with retractable spherical mesal process similar to those of *L. (N.) bakeri* and *knulli*, 0.4 mm long. Maxillary palp 0.7 mm long. Anterior wing, 7.5 mm long. Genitalia (f. 75) having segment X in lateral view smoothly curved with venter linear, being similar to that of *L. (N.) bakeri*. Inferior appendage with incised rounded apex, similar to that of *L. (N.) knulli*.

Female. Genitalia (f. 111) with spermathecal sclerite in lateral view oval, elongated longitudinally, similar to those of *L. (N.) bakeri* and *knulli*.

Immatures, case and habitat. Larval head light brown. Mesonotum light brown, without black posterior margin as in *L. (N.) knulli* and *bakeri*. Legs light brown, midleg tibia with distal apex dark brown. Case of final instar variable, usually turret type, similar to that of *L. (N.) knulli* with fewer long transverse pieces, but sometimes made only of stones. Several larvae collected from a pond with turret cases, few larvae from a stream with stone cases.

Life history. Larvae collected 12 May to 20 August, some reared to pupae and adults in June. Recorded flight dates: 22 March - 9 November.

Distribution. Alaska, Alberta, British Columbia, California, Colorado, Idaho, Maine, Michigan, Montana, Newfoundland, Northwestern Territories, Oregon, Quebec, Saskatchewan, Utah, Washington, Wyoming, and Yukon. Record from Georgia (Unzicker et al. 1982) is a female specimen which is probably *L. (N.) americanum.*

Type data. *Silo cinereus* Banks (1899): "Gazelle, California, September (Morse)." *New Lectotype*, female: Gazelle, California, September 1897. MCZC Type 11691. See type material examined below.

Lepidostoma strophis Ross (1938a): "*Holotype*, male. - Beulah, Michigan: Sept. 16, 1936, Ross & Burks. *Paratypes*. - British Columbia. - Cultus Lake: June 5, 1927, H. H. Ross, 2 males. Michigan - Same data as for holotype, 1 male." Holotype at the INHS (Webb 1980). Paratype male at the INHS (pers. comm. J. D. Unzicker).

Material examined. Lectotype female of *S. cinereus*, (MCZC). **ALASKA:** Prince of Wales Island, N Fork Stoney Cr, 7 males, 12-18 VIII, DGD, (DGD); 9 mi E of Kenai, male, 8 VIII 1957, WM Bryant, (USNM). **ALBERTA:** 2.5 mi E of Nordegg, Shunda Cr Cpg, 22 males, female, 13 VIII 1968, 5 males, 8 VIII 1965; 35 males, 3 females, 8 VIII 1965, APN, (UASM); Cold Cr, Hwy 16, Nojack, male, 3 females, 9 VIII 1967; 2 males, 3 females, 22 VIII 1967, APN, (UASM). **BRITISH COLUMBIA:** 22.6 km E of Princeton, Wolfe Cr, Hwy 3, male, female, 14 IX 1979, APN, (CNCI). **CALIFORNIA:** El Dorado Co: Fallen Leaf Lake, male, 20 VI 1961, SDS, (UICM); Los Angeles Co: Topanga Cyn, 300', larva, 20 VII 1965, WP Vann, (INHS); Plumas Co: Quincy, Spanish Cr, male, 7 females, 26 VI 1973, DRG & SDS, (SDS); Santa Clara Co: Alum Rock Park, male, 1 VI 1960, SDS, (UICM); Siskiyou Co: Shasta River, Weed, 6 males, 29 V 1967, SGJ, (USNM). Sonoma Co: Fairfield, Osborn Preserve, Copeland Cr, 1360', larvae in pools on rocks with stone cases only 20 VIII 1980 (adults reared), LES, (LES). **IDAHO:** Adams Co: New Meadows, Little Salmon River, 5 males, 2 females, 10 IX 1964, SDS & WFB, (UICM) (SDS); Bonner Co: Hope, Lighting Cr, male, 16 IX 1969, SDS & WFB, (UICM); Boundary Co: 5 mi SW of Bonners Ferry, Deep Cr, male, 16 IX 1969, SDS & WFB, (UICM); Butte Co: Craters Moon Natl Monument, 3 males, 2 females, 11 VIII 1965, SDS, (UICM); Gooding Co: Thousand Springs, Riley Cr, male, 12 IV 1965, SDS, (UICM); Idaho Co: Fish Cr, male, 9 XI 1964, WFB, (UICM); Shoshone Co: 3 mi E of Kellogg, Moon Cr, 8 males, female, 16 IX 1964, SDS, (UICM); Twin Falls Co: 1 mi W of Buhl, male, 12 IV 1965, SDS, (UICM). **MICHIGAN:** Montmorency Co: Hunt Cr, 38 males, 30 VIII-3 IX, JW Leonard, (INHS). **MONTANA:** Flathead Co: Glacier Natl Pk, McDonald Cr below McDonald Lake, male, 10 IX 1968, RWB, (USNM). **NORTHWEST TERRITORIES:** Simpson Island, Great Slave Lake, male, 20 VIII 1964, D Larson, (UASM). **OREGON:** Benton Co: MacFadden Pond, 12 mi S of Corvallis on Hwy 99, 5 larvae, 5 pupae, 12 V 1971 (some adults emerged VI), ED Evans, (ROME); Corvallis, 35th Street, Oak Cr, male, 13 VI 1981, D Walters, (OSUO); Harney Co: 8 mi N of Burns, male, 15 VII 1965, KG, (OSUO); Lane Co: Springfield, 1960, 4 males, 8 females, (USNM); 12 mi SE of Eugene, male, 12 IX 1966, KG, (OSUO); Linn Co: Albany, Western Kraft Streams, 5 males, 3 females, 10 V 1972, D Craven, (OSUO); Marion Co: Aumsville, male, 6 VI 1967, KG, (OSUO); Niagra, male, 31 V 1970, E Evans, (OSUO); 12 mi S of Salem, 2 males, female, 4 X 1968, KG, (OSUO); Josephine Co: Grants Pass, male, 24 V 1964, KG, (OSUO). **WASHINGTON:** Cedar Grove, Cedar River, 2 males, 3 XI 1972, ARG, Malick, Stansbury, SDS, (SDS); Chelan Co: Lake Wenatchee, 9 males, female, 27 X 1968, SDS, (SDS); Grant Co: Vantage, Koleche Lake, male, 6 V 1969, J Gooding, SDS, (SDS); Kittitas Co: 4 mi W of Ellensburg, Yakima River, male, 2 V 1969; male, 7 IV 1969; 2 males, 2 females, 14 X 1970, SDS, (SDS); Ellensburg, Carey Pond, 2 males, 2 females, 23 X 1979, SDS, (JSW); Ellensburg, golf course, 9 males, 19 IX 1969, SDS, (JSW); Squaw Cr & Yahima River, male, female, 4 VIII 1977, SDS, (SDS); Pierce Co: Clover Cr, Hwy 7, near Spanaway Lake, 2 males, 14 VI 1969, RWB, (USNM). **WYOMING:** Yellowstone Natl Park, Madison River, male, female, 29 VIII 1963, JR Heaton, (USNM).

Lepidostoma (Nosopus) frosti (Milne)
(f. 6, 9, 76, 112)

Atomyia frosti Milne 1936:119-120, 122, 124 (male).
Lepidostoma frosti: Flint & Wiggins 1961:295-296, f. 12A-B (female); Blickle and Morse 1966:11; Wray 1967:57; McConnochie and Likens 1969:150; Fischer 1970:42-43; Roy and Harper 1975:1084; Etnier and Schuster 1979:19; Roy and Harper 1979:162; Neves 1979:171; Unzicker et al. 1982:9.106, 9.107.

Male. Scape unmodified, cylindrical, 0.4 mm long. Maxillary palps 0.7 mm long. Anterior wing about 7.0 mm long. Genitalia (f. 76) similar to those of *L. (N.) unicolor*, but segment X in lateral view with slender posterior apex, square notch in posteroventral margin.

Female. Genitalia (f. 112) similar to those of *L. (N.) americanum*. Spermathecal sclerite in ventral view oval elongated longitudinally.

Immatures, case and habitat. Larval head light brown with mesal pattern of dark spots, venter (f. 9). First and second larval instars construct cases of fine sand grains. Later instars make a turret case (f. 6) composed of short transverse plant fragments similar to that of *L. (N.) unicolor*. Larvae inhabit springs.

Life history. A concentrated population of *L. (N.) frosti* at Maul Spring, a constant temperature spring in Pennsylvania, was sampled monthly with three 1 ft^2 benthic samples and light-trap collections. The first instars occurred 14 August to 5 November, second instars 14 August to 27 March, third instars 11 October to 27 March, fourth instars 3 December to 19 June, fifth instars 28 February to 16 July, pupae 27 May to 14 August. Recorded flight dates: 20 May - 21 September.

Distribution. Maine, Massachusetts, New Hampshire, New York, North Carolina, Nova Scotia, Pennsylvania, Quebec, Rhode Island, and Tennessee.

Type data. Milne (1936): "*Holotype* male 'Catskills, N.Y., VII-1874, O. Sacken', 1 male *paratype* 'White Mts., N.H., VI, Morrison', 1 no data but 21-IX-1900, in the M.C.Z. Nine other males from P.Q., N.Y., and N.H., 29-VI to 26-VII, 2 in the Can. Nat. collection, 1 in the Amer. Mus. Nat. Hist., 6 in the author's collection." Male and female syntype at the INHS (pers. comm. J. D. Unzicker). I have seen the holotype and 6 paratypes, 2 males and 4 females, at the MCZC, Type 22276. However, the labeled holotype is from New Hampshire, Pinkham, 26 VII 1930, C. A. Frost, differing from locality data given by Milne (1936).

Material examined. MASSACHUSETTS: Hampshire Co: Westhampton, larva, 20 IV 1957; larva, 28 IV 1957, Ubertalli, (USNM). NEW HAMPSHIRE: Pemigewasset River, 22 VI 1941, 8 larvae, THF & HHR, (INHS); Coos Co: Mt Washington, Jefferson Notch Road, Abenaki Brook, male, 5 females, 7-8 VII 1977, JSW, (JSW); ibid, Mt Pleasant Brook, male, 9-10 VII 1977, JSW, (JSW). NORTH CAROLINA: Macon Co: Wayah Crest Cpg, larva, 30 V 1981, JSW & RWH, (JSW); Yancey Co: Black Mts, S Toe River, male, 1 VII 1979, JSW, (JSW); Mt. Mitchell, Camp Alice, 4 larvae, 9 VI 1961, OSF, (USNM). RHODE ISLAND: Washington Co: Richmond, male, female, 30 VI 1971; 2 males, 20 VI 1971, AG Lavalle, (CUCC). PENNSYLVANIA: Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, 2 males, 3 females, 20-21 V 1977; 5 males, 7 females, 31 V 1975; 22 males, 40 females, 19-20 VI 1975; 3 males, 2 females, 22 VI 1977; 2 male pupae, 2 female pupae, 6 VI 1975; 23 males, 31 females, 16-17 VII 1975; 5 males, 20 VII 1977; 7 males, 19 females, 13-14 VIII 1975; larvae, 28 I-22 V 1975; pupae 19 VI-14 VIII 1975; larvae 10 IX 1975-3 I 1976, JSW & JLS, (JSW). TENNESSEE: Sevier Co: Great Smoky Mts Natl Pk, Walker Prong, W Prong Little Pigeon River, 4500', male, female, 4 VII 1979, JSW, (JSW); Great Smoky Mts Natl Pk, 10.2 mi E of Gatlinburg, larvae, 20 V 1970, OSF, (USNM).

Lepidostoma (Nosopus) knulli Ross
(f. 5, 77, 113)

Lepidostoma knulli Ross 1946:269, 280, f. 10A-C (male); Flint 1967c:175; Fischer 1970:58; Flint and Bueno 1977:377, 381-382; Webb 1980:97; Waltz and McCafferty 1983a:414.
Lepidostoma leechi Denning 1962:37-38, f. 5A-C (male); Flint and Bueno 1977:381 (as syn. of *L. knulli*).

Male. Scape 0.8 mm long, modified with retractable spherical mesal process similar to that of *L. (N.) cinereum* and *bakeri*. Maxillary palps 0.9 mm long. Anterior wing 8.2 mm long. Genitalia (f. 77) having segment X similar to that of *bakeri* with many dorsal tubercles, and inferior appendage similar to that of *L. (N.) cinereum* with rounded apex.

Female. Genitalia (f. 113) similar to those of *L. (N.) bakeri*. Spermathecal sclerite in lateral view elongated dorsoventrad, in ventral view oval and elongated longitudinally. Segment IX with short blunt apodeme.

Immatures, case and habitat. Larva having mesonotum light brown with dark posterior margin similar to that of *L. (N.) bakeri*. Turret case (f. 5) with many long transverse plant fragments. Based on collection data immatures appear to inhabit small streams.

Life history. Several larvae and pupae were taken 8 to 18 June. Recorded flight dates: 5 May - 18 December.

Distribution. Arizona, Durango, Michoacan, Mexico State, and New Mexico.

Type data. *Lepidostoma knulli* Ross (1946): "*Holotype*, male. - Oak Creek Canyon, Arizona, Aug. 15, 1938, D. J. & J. N. Knull." Holotype at the INHS (Webb 1980). See type material examined below.

Lepidostoma leechi Denning (1962): "*Holotype* male, one mile west of La Marquesa, Mexico, approximately 9200 feet elevation (34 kilometers west of Mexico, D.F.), December 8, 1948, H. B. Leech. Type deposited in the collection of the California Academy of Sciences, San Francisco, California."

Material examined. Holotype male (INHS). **ARIZONA:** Cochise Co: Chiricahua Mts, Southwestern Research Station, 5 mi SW of Portal, Cave Cr, male, 9 VI 1961, JK, (INHS); Chiricahua Mts, Rucker Canyon, male pupa, 7 larvae, 8 VI 1968, Menke & OSF, (USNM); Oak Cr Canyon, Halfway Camp, 9 larvae, 18 VI 1968, OSF & Menke, (USNM); Coconino Co: W Fork Oak Cr, 5 females, 19 IX 1979; 6 males, female, 19 X 1978, MWS, (JSW). **NEW MEXICO:** Catron Co: Gila Natl Forest, Scorpion Camp, W Fork Gila River, male, 5-6 V 1981, WP McCafferty & AV Provonsha, (PURC).

Lepidostoma (Nosopus) unicolor (Banks)
(f. 34, 47, 78, 114)

Mormomyia unicolor Banks 1911:357, pl. 12 f. 21 (male).
Lepidostoma unicolor: Etnier 1965:151; Anderson 1967:517, (case); Fischer 1970:67-68; Anderson and Wold 1972:192, 197-198; Hilsenhoff 1975:25; Anderson 1976:123; Anderson et al. 1978:71, 72; Nimmo and Scudder 1978:120; Resh and Sorg 1978:396; Roy and Harper 1979:163; Grafius and Anderson 1980:808-816; Hilsenhoff 1981:31; LaFontaine 1981:249, 251; Baumann and Unzicker 1981:27; Roemhild 1982:11; Anderson et al. 1982:14; Nimmo and Scudder 1983:74, 80; Anderson et al. 1984:15, 18; Ruiter and Lavigne 1985:43; Herrmann et al. 1986:435.

Male. Head (f. 34) with scape cylindrical and unmodified, 0.5 mm long and maxillary palps 0.7 mm long. Wings (f. 47) with venation similar to that of *L. (N.) modestum*. Anterior wing 9.0 mm long. Genitalia (f. 78) similar to those of *L. (N.) frosti*, but segment X with acute angle in ventrolateral margin in lateral view.

Female. Wings (f. 47). Genitalia (f. 114) similar to those of other species of *unicolor* group. Spermathecal sclerite somewhat triangular in ventral view.

Immatures, case and habitat. Larva mesonotum brown without black posterior margin, setae of hind leg not as numerous as in *L. (N.) bakeri*. Contributions to the bionomics of *L. (N.) unicolor* have been documented by Anderson (1967), Anderson and Wold (1972), Anderson (1976), Anderson et al. (1978), and Resh and Sorg (1978). Larvae inhabit mountain streams. Final instar larvae construct turret cases similar to those of *L. (N.) knulli*, but sometimes with fewer long transverse pieces.

Life history. Larvae occur from October to July, pupae April to 3 September. Recorded flight dates: 9 April - 27 September.

Distribution. Alberta, Arizona, British Columbia, California, Colorado, Idaho, Minnesota, Montana, New Mexico, Oregon, Quebec, Saskatchewan, South Dakota, Utah, and Wyoming.

Type data. Banks (1911): "From Switzer's Camp, San Gabriel Mountains, California, June (Grinnell coll.)." A female syntype is at the INHS (pers. comm. J. D. Unzicker).

Mormomyia unicolor Banks, *New Lectotype*, Switzer's Camp, San Gabriel Mountains, California, June, MCZC Type 11686.

Material examined. ALBERTA: Carrot Cr, old Hwy 16, 3 males, 1 female, 25 VII 1976, APN, (UASM); Cold Cr, Hwy 16, Nojack, male, female, 25 VII 1976, APN, (UASM); Waterton R at bridge, Hwy 5, Waterton Lakes Natl Pk, male, female, 31 VII 1976, APN, (US). **ARIZONA**: Cochise Co: Herb Martyr Cpg, 7 mi W of Portal, 4 larvae, male & female pupae, 23 VI 1966, GBW, (ROME); Southwestern Research Station, 5 mi SW of Portal, Cave Cr, male pupa, 7-10 VI 1968, OSF & Menke, (USNM); Chiricahua Mts, E Turkey Cr, many larvae, 9 VI 1968, OSF & Menke, (USNM). **BRITISH COLUMBIA**: U BC Exp Forest, Spring Cr, male, 28 VII 1981, K Van Frankenhuyzen, (OSUO); Vancouver Island, Tsable R, Hwy 19, S of Courtney, male, 8 VII 1979, APN, (UASM); Vancouver Island, 28.2 km W of Caysuse, male, 7 VII 1979, APN, (UASM); Shannon Cr, Hwy 99, 5.7 km, S of Squamish, male, 12 VII 1979, APN, (UASM); Hwy 97, 9 km N of Lac la Hache, male, 14 VII 1979, APN, (CNC). **CALIFORNIA**: Modoc Co: 5 mi E of Likely, S Fork of Pit River, 17 males, 13 females, 5 IX 1969, AB Gurney, (USNM); Mono Co: Barnes Lake, 15 mi W of Bridgeport, male, female, 20 VII 1979, SDS, (SDS); San Diego Co: Potreros, 5 males, 12 females, 9 IV 1974, H & MT, (CUCC); Santa Clara Co; Guadalupe Cr, male, 6 VIII 1960, SDS, (UICM); Alum Rock Park, male, VI 1960, SDS, (UICM); Sonoma Co: Fairfield, Osborn Preserve, Copeland Cr, 1540', larvae in pools 27 IV 1980 (adults reared), LES, (LES). **COLORADO**: Routt Co: Steamboat Springs, Fish Cr, male, 11 VIII 1973, DLP & SDS, (SDS). **IDAHO**: Custer Co: 7 mi S Stanley, Red Fish Lake, 2 males, 3 females, 2 VIII 1964, SDS, (JSW); ibid, male, 23 VII 1965, SDS (UICM); Idaho Co: Grave Park, Selway-Bitterroot Wilderness Area, male, 21 VII 1969, LM & WB Potter, (USNM); ibid, Wind Lake outlet stream, 3 males, 25 females, 4 IX 1980, SDS, (JSW); Kootenai Co: 3 mi NE Coeur d'Alene, male, 22 VI 1961, RE Stecker, (UICM); Valley Co: S of Yellow Pine, male, female, 3 VIII 1964, SDS & RLW, (SDS). **MONTANA**: Lincoln Co: Libby, Libley Cr, 5 males, 2 females, 19 IX 1986, DLG, (JSW). **OREGON**: Baker Co: Blue Mt., Spring Cr, male, 23 VI 1974; male, 16 VIII 1969, JHB, (USNM); Benton Co: 7 mi NW of Corvallis, male, 27 VIII-3 IX 1968, CD Kerst, (USNM); Crook Co: Ochoco Mts near summit, Hwy 26, male, 31 VII 1965, SGJ, (USNM); Lane Co: HJ Andrews Exp For, Mack Cr, 2 males & 3 females reared, 15 VI 1973, NHA, (OSUO); Lincoln Co: Flynn Cr, pupa in soft wood 19 VIII 1981 (male emerged 23 VIII), RWW, (OSUO); ibid, larvae? prepupae? male pupa, 22 VI 1982, SB & AL Flotsam; ibid, 10 mi S of Toledo, male pupa from decaying wood, 12 VII 1977, TL Dudley, (OSUO); ibid, Oak Creek Drippery, reared from eggs, male pupa & male emerged 15 VI 1974, (OSUO); Needle Branch Cr, 10 mi S of Toledo, larvae 24 IV 1974, (male pupa, 7 males, 6 females, emerged VI-VII), NHA, (OSUO); Jefferson Co: Metolius River, 1 mi S of Camp Sherman, male & female pupae, 3 IX 1964, NHA, (OSUO); Union Co: Goose Cr, 15 mi E of Medical Springs, male, female, 22 VIII 1975; male, 5 IX 1978, MRB, (SDS); Lick Cr, 6 mi E of Medical Springs, males & females, 29 VII-5 IX 1975, MRB, (SDS); Jordan Cr, 20 mi SW La Grande, males & females, 25 VII-18 VIII 1975, MRB, (SDS); Velvet Cr, 8 mi E of Medical Springs, males & females, 22 VII-19 VIII 1975, MRB, (SDS). **SOUTH DAKOTA**: Spearfish Cr, male, 11 females, 7 VII 1965, RW Hodges, (USNM). **UTAH**: Salt Lake Co: Thousand Springs, Mill Cr Canyon, male, 25 VII 1973, RWB, (USNM). **WASHINGTON**: Kittitas Co: Dickey, Tearway Cr, male, 7 IX 1968, SDS, (SDS); 6.5 mi N of Ellensburg, Wilson Cr, male, 29 VII 1980, DRG, (SDS); Lewis Co: 5 mi E Randle, Davis Cr, male, 24 VII 1980, SDS, (SDS). **WYOMING**: Yellowstone Natl Park, Madison River Junction, male, 2 females, 21 VIII 1955, KM Fender, (USNM); Teton Co: near Moose, Grand Teton Natl Pk, male, 4 VIII 1973, DLP & JP, (SDS).

Lepidostoma (Nosopus) Mexicanum Group

This group comprises *L. (N.) acarolum, aztecum, dafila, delongi, denningi, frontale, lacinatum, leonilae, mexicanum, oaxacense, quila, rectangulare, reimoseri, steinhauseri*, and *talamancense*. However, *L. (N.) acarolum* and *delongi* are only tentatively included within this group.

Male. Head (f. 35) with scape cylindrical, not highly modified. Maxillary palps with segmentation obscure, mesal surface bearing scales, apical portion usually spatulate, but triangular in *L. (N.) mexicanum*. Wings (f. 49-53) having forewing with venation similar to that of *L. (N.) unicolor* group, anterior costal cell usually absent (f. 53), but sometimes with small basal pocket (f. 52); however *L. (N.) frontale* with long narrow anterior marginal fold (f. 51). Hindwing unique, having both *F*1 and *F*2, but in *L. (N.) acarolum* (f. 50) and *delongi* (f. 49) *F*2 absent; 1*A* and 2*A* not fused together completely (except in *L. [N.]) talamancense*). Genitalia (f. 79-91) with inferior appendages variable; *L. (N.) mexicanum* and *frontale* with first article broad basally, venter truncated, short, with slender horizontal dorsal process extended posteriorly, and with apex usually tricuspid in dorsal view; most other species of *L. (N.) mexicanum* group with serrate subapical lateral flange.

Female. Only females of *L. (N.) acarolum, lacinatum*, and *mexicanum* known. Genitalia (f. 115, 116) having spermathecal sclerite similar to that of *L. (N.) unicolor* group, but longer, with ventral keyhole-shaped mesal process about 2/3 as long as sclerite in ventral view. Several unidentified females from Central America, (probably of the *L. [N.] mexicanum* group) with similar long spermathecal sclerite.

Immatures, case and habitat. Larval head with distinct carina in *L. (N.) acarolum* and *talamancense*, weak carina present in *L. (N.) mexicanum*. Larvae of other species unknown. Some unidentified larvae from Central America (and probably of this group) with metanotal *sa*2 sclerite bearing three or more setae, sometimes without carina on head. Larva of *L. (N.) acarolum, mexicanum*, and *talamancense* construct cylindrical cases of small stones (f. 3). Most other unidentified larvae of the *L. (N.) mexicanum* group will probably key to couplet 11 in the larval key of *Lepidostoma* species herein. However, I have examined several other unidentified larvae from Central America which construct cases of plant fragments.

Distribution. The majority of species in the *L. (N.) mexicanum* group occur in Central America. However, a few species, such as *L. (N.) mexicanum* and *delongi* have ranges extending into the southwestern United States, and one species, *L. (N.) acarolum*, is known only from Arizona and New Mexico.

Lepidostoma (Nosopus) acarolum Denning
(f. 3, 50, 79, 115)

Lepidostoma acarola Denning 1962:38-39, f. 6A-B (male).

This species is tentatively included in the *L. (N.) mexicanum* group.

Male. Scape not highly modified, cylindrical, 0.7 mm long. Maxillary palps slender and spatulate, 0.7 mm long. Wings (f. 50) brown, venation similar to that of *L. (N.) unicolor*. Anterior wing about 7.5 mm long, not highly modified. Hindwing without *F*2. Genitalia (f. 79) having segment X in lateral view with dorsum short and curved caudad into narrow upturned ventroapical point, venter sinuate and longer than dorsum. Parameres rather broad in lateral view. Inferior appendage similar to that of *L. (N.) bakeri*, with hooked apex, but with shorter basodorsal process.

Female. Genitalia (f. 115) with spermathecal sclerite in lateral view elongated longitudinally; in ventral view, posterior end truncated and anterior end tapered.

Immatures, case and habitat. Larval head brown, cylindrical, vertex flat with circular carina. Case (f. 3) cylindrical, slightly curved posteriorly and composed of small stones. Case of final instar with anterior width 2.1-2.3 mm, posterior width 1.2-2.0 mm, and length 9.0-11.0 mm.

Life history. Several larvae and pupae collected in June. Recorded flight dates: 13 - 25 August.

Distribution. Arizona and New Mexico.

Type data. Denning (1962): "*Holotype* male, Cochise County, Arizona, Southwestern Research Station, five miles northwest of Portal, August 25, 1960, D. C. Rentz. *Allotype*. - female, same data as for holotype. *Paratypes* (1 male, 1 female) same data as the holotype. Holotype and allotype deposited in the collection of the Academy of Sciences, San Francisco, California."

Material examined. ARIZONA: Cochise Co: Southwestern Research Station, 5 mi SW of Portal, seep, male pupa, 50 larvae, 7-8 VI 1968, OSF & Menke, (USNM). NEW MEXICO: Catron Co: Glenwood, 2 males, 5 females, 13-14 VIII 1978, MWS, (JSW); I wish to thank Milton W. Sanderson for giving me these specimens.

Lepidostoma (Nosopus) aztecum Flint & Bueno
(f. 80)

Lepidostoma aztecum Flint and Bueno 1977:376, 378, f. 2-3 (male); Bueno and Padilla 1981:391.

Male. Scape cylindrical, 0.6 mm long. Maxillary palp similar to that of *L. (N.) modestum*, 0.6 mm long. Wings with venation similar to that of *L. (N.) lacinatum*. Anterior wing 10.7 mm long. Genitalia (f. 80) similar to those of *L. (N.) lacinatum*. Segment X in lateral view with two short dorsal processes. Inferior appendage main article in lateral view with hatchet-shaped apex and pointed bifid subapical lateral flange.

Female. Unknown.

Immatures, case and habitat. A male pupa close to *L. (N.) aztecum* was examined with a cylindrical case of small stones similar to that of *L. (N.) mexicanum*.

Life history. Pupa (possible) collected in August. Recorded flight dates: 2 June - 7 November.

Distribution. Morelos and Veracruz.

Type data. Flint and Bueno (1977): "*Holotype*, male: Mexico, Morelos, Lagunas Zempoala, 2 June 1976, J. Bueno-Soria. USNM Type 74073. *Paratype*: Same data, 1 male." See type material examined below.

Material examined. Holotype male, (USNM). VERACRUZ: Perote, male, 7 IX 1977, JB, (USNM); La Joya, Rt 140, km 307, (probable) male pupa, 4 pupae, 21 VII 1965, OSF & Ortiz, (USNM).

Lepidostoma (Nosopus) dafila Bueno & Contreras

Lepidostoma dafila Bueno and Contreras 1986:209-210, f. 7-9 (male).

The following is based on the original species description. This species is closely related to *L. (N.) heveli*, having similar male segment X. It differs from all known members of the *L. (N.) mexicanum* group by lacking a basodorsal process of the inferior appendage.

Male. Scape cylindrical. Maxillary palp unsegmented with basal portion narrow and cylindrical and apical portion broader and ellipsoidal. Anterior wing 8 mm long. Posterior wing without *F2* (pers. comm. Bueno). Genitalia: Segment X in lateral view having two linear processes nearly parallel to each other, subequal in length, directed posteriad, and separated widely by U-shaped notch; dorsal process with pointed apex and more slender than ventral process; ventral process bearing subapical trapezoidal extension ventrad and with fingerlike apex. Phallus with slender parameres about half as long as phalicata. Inferior appendage in lateral view having main article broad and rectangular, dorsum with short extension posteriad, without basodorsal process, horizontal middorsal process broad and acuminate.

Female, immatures, cases and habitat. Unknown.

Life history. Holotype collected 17 June.

Distribution. Oaxaca. Only known from the type locality.

Type data. Bueno and Contreras (1986): "*Holotipo* macho. Mexico: Oaxaca, Finca Pacífica Mpio. de Pluma Hidalgo, recolectado el 17 de junio de 1982 por E. Barrerra. Depositado en el IBUNAM."

Lepidostoma (Nosopus) delongi Ross
(f. 49, 81)

Lepidostoma delongi Ross 1946:270, 283, f. 12A-B (male); Fischer 1970:42; Flint and Bueno 1977:377, 380; Webb 1980:97; Bueno and Padilla 1981:391.

This species is tentatively included in the *L. (N.) mexicanum* group.

Male. Scape, cylindrical, not highly modified, 1.0 mm long. Maxillary palps fingerlike, concave mesially, 1.2 mm long. Wings (f. 49) with venation similar to that of *L. (N.) roafi* and *unicolor*. Anterior wing about 7.0 mm long. Genitalia (f. 81) having segment X in lateral view with dorsum slightly curved, bearing two or three small tubercles, posterior with obtuse apical notch, venter nearly linear with a square apical angle. Parameres spinous. Inferior appendage narrow with apex bifid in dorsal view.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 7 February - 10 December.

Distribution. Chiapas, Michoacan, and Morelos.

Type data. Ross (1946): "*Holotype*, male. - Zitacuara, Mexico, at light, 1941, D. M. Delong." Holotype at the INHS (Webb 1980).

Type material. CHIAPAS: Finca Esperanza, 5 males, 12 V-5 VII 1938; male, 6 XII 1938; male, 10 XII 1938, AD, (INHS); Finca Germania, male, 2 VI 1935, AD, (INHS); Finca Vergel, male, 12 V 1935; male, 23 V 1935; male, 28 V 1935; 2 males, 7 VI 1935, AD, (INHS); Finca Victoria, male, 2 VI 1935, AD, (INHS). MORELOS: Park Nac. Zempoala, male reared, 7 II 1977, JB, (USNM).

Lepidostoma (Nosopus) denningi Weaver n. sp.
(f. 82)

This species is closely related to *L. (N.) rectangulare*, but differs by having male inferior appendage with apex of main article rounded, rather than rectangular.

Male. Scape simple, cylindrical, 0.6 mm long. Maxillary palps spatulate, 0.6 mm long. Wings with venation similar to that of *L. (N.) lacinatum*. Anterior wing 8.5 mm long, with small basal anterior marginal fold. Genitalia (f. 82) similar to those of *L. (N.) rectangulare*. Segment X in lateral view with posterior margin serrate. Parameres at least as broad as phalicata. Inferior appendage in lateral view with subapical lateral flange oval, apex of main article rounded.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight date: 21 June.

Type material. *Holotype*: CHIAPAS: San Cristobal, (at light), male, 21 June 1926, AD, (USNM).

Etymology. This species is named after Donald G. Denning in honor of his contributions to the taxonomy of Trichoptera.

Lepidostoma (Nosopus) frontale (Banks)
(f. 51, 83)

Eremopsyche frontalis Banks 1901:367, pl. 7 f. 13, 14 (male); Fischer 1970:83; Flint 1967a:23.
Lepidostoma frontalis: Flint 1967a:24, f. 124, 125 (male).
Lepidostoma frontale: Flint and Bueno 1977:375, 380-381; Bueno and Padilla 1981:391.

Male. Scape cylindrical, but bent near base, 1.2 mm long. Maxillary palp about 1.2 mm long, apex spatulate with many black setae. Wings (f. 51): Anterior wing with long narrow anterior marginal fold, 9.0 mm long. Genitalia (f. 83) identical to some variants of *L. (N.) mexicanum*, but characters of the maxillary palps and wings are diagnostic.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 1 August - 10 December.

Distribution. Hidalgo and Veracruz.

Type data. Banks (1901): "One specimen from Jalapa, Vera Cruz, September."

Eremopsyche frontalis Banks, *New Lectotype*, male, Jalapa V.C. Sept., MCZC Type 11825. See type material examined below.

Material examined. Lectotype male, (MCZC). **VERACRUZ:** La Joya, Hwy 140, km 307, male, 1 VIII 1966, OSF & Ortiz, (USNM); Rio Jamapa, 6 km N of Coscomatepec, male, 2 V 1981, CMF & OSF, (USNM).

Lepidostoma (Nosopus) heveli Flint & Bueno
(f. 52, 84)

Lepidostoma heveli Flint and Bueno 1977:376, 381, f. 4-5 (male).

Male. Scape not highly modified, cylindrical, 0.6 mm long. Maxillary palp capitate, 0.6 mm long. Wing venation (f. 52) similar to that of *L. (N.) lacinatum*, but anterior wing, about 10 mm long, with small basal anterior marginal fold. Genitalia (f. 84) similar to those of *L. (N.) steinhauseri*. Segment X in dorsal view with narrow mesal and lateral processes. Parameres in lateral view not quite as broad as middle of phalicata.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight date: 28 May.

Distribution. Guatemala. Only known from the type locality.

Type data. Flint and Bueno (1977): "*Holotype* male: Guatemala, Quiche, El Quiche, 7.3 km S Chichicastenango (14°54'N, 91°07'W), 2400 mts., 28 May 1973, Erwin & Hevel. USNM Type 74074." See type material examined below.

Material examined. Holotype male, (USNM).

Lepidostoma (Nosopus) lacinatum Flint
(f. 53, 85)

Lepidostoma lacinatum Flint 1967c:175-176, f. 24-25 (male); Denning 1973:142, f. 12 (male); Flint and Bueno 1977:377, 382.

Male. Scape simple, cylindrical, 0.7 mm long. Maxillary palp spatulate, 0.7 mm long. Wings (f. 53) anterior wing about 9.3 mm long, without anterior marginal fold. Posterior wing with *F*1 and *F*2. Genitalia (f. 85) similar to those of *L. (N.) aztecum*, but segment X in dorsal view with shorter dorsal process. Inferior appendage in lateral view with main article broad somewhat oval and tapered into blunt apex, subapical lateral flange serrated with about six teeth, mesal process in dorsal view narrow and acuminate with apex bent mesad.

Female. Scape 1.0 mm long. Forewing brown, 12.0 mm long. Genitalia with spermathecal sclerite similar to that of *L. (N.) mexicanum*, but more oval in ventral view.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 24 May - 31 October.

Distribution. Arizona, Durango, and Sinaloa.

Type data. Flint (1967c): "*Holotype*, male. Mexico (Durango), 10 miles west of El Salto, 9000', 2 July 1964, J. E. H. Martin. *Paratypes*. Same data, 3 males; 6 June 1964, 1 male; 8 June 1964, 2 males; 13 June 1964, 1 male; 17 June 1964, 3 males; 27 June 1964, 1 male; 7 July 1964, 1 male; 15 July, 1964, 1 male; 29 July 1964, 1 male. Mexico (Sinaloa), El Palmito, 15 July 1964, J. F. McAlpine, 1 male." See type material examined below.

Material examined. Male paratype, (USNM). **ARIZONA:** Cochise Co: 15 m S of Sierra Vista, Ramsey Cyn., 6000', 2 males, 2 females, 24 V 1967; 7 males, 11 females, 20 VII 1967; 16 males, 9 females, 1-31 X 1967, 9 males, 17 females, XI 1967; RF Sternitzky, (CNCI).

Lepidostoma (Nosopus) leonilae Bueno & Contreras

Lepidostoma leonilae Bueno and Contreras 1986:209, f. 4-6 (male).

The following is based on the original species description. It is not clearly apparent that this species is closely related to any other particular known species of the *L. (N.) mexicanum* group, but perhaps it is close to *L. (N.) reimoseri*. It has male segment X similar to *L. (N.) bryanti* and some forms of *L. (N.) frontale*. However, its male inferior appendage is more like that of *L. (N.) reimoseri*, from which it differs by having main article more acuminate in lateral view and lacking a subapical ectal point.

Male. Maxillary palp unsegmented and triangular in lateral view, perhaps similar to that of *L. (N.) mexicanum*. Anterior wing 9 mm long. Posterior wing with *R* five-branched (pers. comm. Bueno). Genitalia: Segment X pentagonal in lateral view, having an obtuse angle, anterior dorsum with about four tubercles, posterior dorsum and venter smooth; posterior margin bearing two prominent points (one ventral point and one mesal point) and two smaller dorsal points, all points directed dorsad. Phallus with slender parameres about 3/4 as long as phalicata. Inferior appendage in lateral view having main article slender and acuminate, bearing basodorsal process prominent and thumblike, and horizontal middorsal process lobiform and about half as long as basodorsal process, but without subapical ectal point or flange.

Female, immatures, cases and habitat. Unknown.

Life history. Holotype collected 16 March.

Distribution. Nuevo León. Only known from the type locality.

Type data. Bueno and Contreras (1986): "*Holotipo* macho. Mexico: Nuevo León: Santiago Potero Redondo, recolectado el 16 de marzo de 1984 por A. Contreras. Depositado en IBUNAM."

Lepidostoma (Nosopus) mexicanum (Banks)
(f. 35, 86, 116)

Olemira mexicana Banks 1901:367; Flint 1967a:24.
Lepidostoma mexicana: Flint 1967a:24, f. 126, 127 (female holotype).
Lepidostoma mexicanum: Fischer 1970:59-60; Flint and Bueno 1977:375, 382-383.
Atomyiodes bispinosa Ulmer 1911:25-26, f. 12-13 (male); Flint and Bueno 1977:382 (*A. bispinosus* as syn. of *L. mexicanum*).
Lepidostoma bispinosa: Denning 1962:39, f. 7A-C (male); Flint 1967c:175.
Lepidostoma alexanderi Denning 1962:37, f. 4A-C (male, female); Flint 1967c:175 (as syn. of *L. bispinosa*).

Some variants of male genitalia of *L. (N.) mexicanum* are virtually identical to those of *L. (N.) frontale*. However, these species are easily distinguished by having unique secondary sexual characters expressed in the male antennal scape and forewing.

Male. Head (f. 35) with scape cylindrical, 0.9 mm long. Maxillary palps triangular, 1.0 mm long. Wings with venation similar to that of *L. (N.) lacinatum*. Anterior wing brown, 7.5 mm long, without anterior marginal fold. Genitalia (f. 86) often very similar to those of *L. (N.) frontale*.

Female. Genitalia (f. 116) with spermathecal sclerite in ventral view oval and elongated longitudinally with keyhole-shaped process 2/3 as long as sclerite. The genitalia of the female holotype are illustrated by Flint (1967a).

Immatures, case and habitat. Larval head brown with weak carina around posterior dorsal perimeter. Case cylindrical, slightly curved and composed of small stones, similar to that of *L. (N.) acarolum*. Several larvae and pupae collected in June.

Life history. Recorded flight dates: 7 February - November.

Distribution. Widespread throughout Central America and southwestern United States including Arizona, Colorado, Costa Rica, Guatemala, Mexico, and Panama.

Type data. *Olemira mexicana* Banks (1901): "One specimen from Tacubaya, November."

Olemira mexicanam Banks, *New Lectotype*, female, Tacubaya, Mex., MCZC Type 11824. See material examined below.

Atomyiodes bispinosa Ulmer (1911): "1 male, Costa Rica, San José, Stieler leg., im Berliner Museum." One possible syntype at the INHS (J. D. Unzicker).

Lepidostoma alexanderi Denning (1962): "*Holotype* male, Southwestern Research Station, Chiricahua Mountains, Cochise County, Arizona, August 7-12, 1957, C. P. Alexander. *Allotype*. - female, same data as for holotype. *Paratypes* (4 males, 19 females) same data as the holotype." See type material examined below.

Material examined. Lectotype female (MCZC) of *O. mexicanam*. ARIZONA: Cochise Co: Southwestern Research Station, 5 mi SW of Portal, Cave Cr, 3 males, 3 females, 23 V 1967, PJ Spangler, (USNM); 3 males, 2 females, 11 VII 1963, CPA, (USNM); male (paratype of *alexanderi*), 7-12 VIII 1957, CPA, (USNM); 11 males, 6 females, 12 VIII 1974; 9 males, 1-8 IX 1974, H & MT, (CUCC). **COLORADO:**

Jackson Co: Gould, 4 VIII 1974, 3 males, 2 females, H & MT, (CUCC). **COSTA RICA:** Cartago, 2 male pupae, 24 VI 1967, OSF & Ortiz, (USNM); Heredia, Los Cartagos, male, 24 VI 1967, PJ Spangler, (USNM); Vara Blanca, 4 larvae, male pupa, 1 VI 1967, OSF & Ortiz, (USNM). **MEXICO: DISTRITO FEDERAL:** male, 30 VI 1938, AD, (INHS); **MORELOS:** Cuernavaca, male, 23 III 1932, AD & Plummer, (INHS); Park Nac Zempoala, male, 7 II 1977, JB, (USNM). **PANAMA:** Chiriqui, El Volcan, Chiriqui Viejo River, male, 22 VII 1964, A Broce, (USNM).

Lepidostoma (Nosopus) oaxacense Bueno & Contreras

Lepidostoma oaxacensis Bueno and Contreras 1986:208-209, f. 1-3 (male).

The following is based on the original species description. This species is apparently closely related to *L (N.) quila* by having similar apex of male inferior appendage in dorsal view, but it differs by having segment X in left lateral view C-shaped.

Male. Maxillary palp unsegmented and cylindrical. Anterior wing 6 mm long. Posterior wing *R* only four-branched (pers. comm. Bueno). Genitalia: Segment X in left lateral view C-shaped, having ventral process acuminate and curved dorsoposteriad, and dorsal process more blunt and linear, and bearing about three tubercles. Phallus with slender parameres about 3/4 as long as phalicata. Inferior appendage, in lateral view main article broad and rectangular, having apex in dorsal view similar to that of *L (N.) quila* with broad mesal lobe and posterior point, but without subapical extal point; basodorsal process slender and fingerlike; horizontal middorsal process slender acuminate and subequal in length to basodorsal process.

Female, immatures, cases and habitate. Unknown.

Life history. Holotype collected in December.

Distribution. Oaxaca. Only known from the type locality.

Type data. Bueno and Contreras (1986): "*Holotipo* macho. Mexico: Oaxaca, Carretera No. 175 Portillo del Rayo a 1540 m.s.n.m., recolectado el lo de diciembre de 1982 por A. Ibarra y M. García. Depositado en IBUNAM."

Lepidostoma (Nosopus) quila Bueno & Padilla
(f. 87)

Lepidostoma quila Bueno and Padilla 1981:389-391, f. 1-2 (male).

This species is similar to *L. (N.) talamancense, delongi* and *denningi* by having male inferior appendage with a subapical flange which is not serrated. However, it is distinct, having inferior appendage with acuminate subapical flange projecting from position about a third length from apex of first article.

Male. Forewing 11 mm long. Hindwing with *R*5, *F*1 and *F*2 present. Genitalia (f. 87) with segment X similar to that of *L. (N.) aztecum,* but inferior appendage in lateral view with first article acuminate.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 3-18 August and 2 December.

Distribution. Mexico State and Morelos.

Type data. Bueno and Padilla (1981): "*Holotipo* macho. Lugunas de Zempoala, Estado de México. 3-VIII-78. Colectó: J. Bueno. *Paratipos* 9 machos 18-VIII-79. Colectados por J. Padilla y M. Rivera. Holotipo y paratipos están depositados en la Colleción Entomológica del Instituto de Biología, UNAM." See type material examined below.

Material examined. I have examined one male paratype kindly offered as a gift by Joaquin Bueno Soria; however, its collection data were not listed in the original description: **MORELOS:** Zempoala laguna, 2 XII 1978, J. Padilla, (JSW).

Lepidostoma (Nosopus) rectangulare Flint
(f. 88)

Lepidostoma rectangulare Flint 1967c:176, f. 26-27 (male); Flint and Bueno 1977:377, 383.

Male. Scape not highly modified, cylindrical, 0.6 mm long, similar to *L. (N.) mexicanum*. Maxillary palp 0.6 mm long, spatulate. Wings with venation similar to that of *L. (N.) lacinatum*. Anterior wing without anterior marginal fold, 9.0 mm long. Genitalia (f. 88) similar to those of *L. (N.) denningi*. Inferior appendage distinctive in lateral view, main article truncated apically, serrated subapical lateral flange with three teeth. Parameres in lateral view with apices hooked dorsad.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight date: 25 July.

Distribution. Durango. Only known from the type locality.

Type data. Flint (1967c): "*Holotype*, male. Mexico (Durango), 10 miles west of El Salto, 9000' 25 July 1964, W. C. McGuffin." See type material examined below.

Material examined. Holotype male, (CNCI).

Lepidostoma (Nosopus) reimoseri Flint & Bueno
(f. 89)

Lepidostoma reimoseri Flint and Bueno 1977:377, 383-384, f. 10-11 (male).

Male. Scape not highly modified, cylindrical, 1.0 mm long. Maxillary palp short, 0.5 mm long, slender fingerlike. Wings similar to those of *L. (N.) lacinatum*. Anterior wing 9.5 mm long without costal cell. Genitalia (f. 89) having segment X with many dorsal tubercles. Inferior appendage with subapical lateral flange inconspicuous in lateral view, but small apicolateral point in dorsal view.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 21 - 28 May.

Distribution. Costa Rica. Only known from the type locality.

Type data. Flint and Bueno (1977): "*Holotype*, male: Costa Rica [Cartago], Volcan Irazu, 2200-2500 m., 21-28 May 1930, Reimoser (Vienna Museum). *Paratype*: Same data, 1 male (U.S.N.M.)." See type material examined below.

Material examined. Paratype male, (USNM).

Lepidostoma (Nosopus) steinhauseri Flint & Bueno
(f. 90)

Lepidostoma steinhauseri Flint and Bueno 1977:376, 384-386, f. 6-7 (male).

Male. Scape not greatly modified, cylindrical, 0.7 mm long. Maxillary palp fingerlike, 0.5 mm long. Wings with venation similar to that of *L. (N.) lacinatum*. Anterior wing about 11 mm long, with small basal costal cell. Genitalia (f. 90) similar to *L. (N.) heveli*; but segment X in dorsal view with mesal process broader than lateral process. Parameres at least as broad as midsection of phalicata in lateral view.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight date: 23 January.

Distribution. El Salvador. Only known from the type locality.

Type data. Flint and Bueno (1977): "*Holotype* male: El Salvador, Santa Ana, Cerro Miramundo, 2300 m., 23 Jan. 1971, S. Steinhauser. USNM Type 74075." See type material examined below.

Material examined. Holotype male, (USNM).

Lepidostoma (Nosopus) talamancense Flint & Bueno
(f. 91)

Lepidostoma talamancense Flint and Bueno 1977:376, 386, f. 8-9 (male).

Male. Scape not highly modified, cylindrical, 0.6 mm long. Maxillary palps spatulate, 0.5 mm long. Wings with venation similar to that of *L. (N.) lacinatum*, except posterior wing with 1*A* and 2*A* completely fused. Anterior wing 9-13 mm long, without costal cell. Genitalia (f. 91) having segment X in lateral view with three undulate lobes, middle lobe largest. Parameres sinuate at base. Inferior appendages with subapical lateral flange located near apex and only conspicuous in dorsoventral aspect.

Female. Unknown.

Immatures, case and habitat. Larval head, chestnut brown, vertex convex and with carina extended laterally, defining perimeter, shaped like a USA World War I Army helmet. Cases of late and early instars cylindrical and composed of small stones. Case of final instar with anterior width 2.0 mm, posterior width 1.5-1.8 mm, and length 9.0-10.0 mm. I have examined several larvae and pupae collected in June at the type locality, Ojo de Agua (eye of water), a very large spring.

Life history. Several different instars of larvae and mature pupae collected 30 June. Recorded flight dates: 20 - 30 June.

Distribution. Costa Rica. Only known from the type locality.

Type data. Flint and Bueno (1977): "*Holotype*, male: Costa Rica, Cartago, Ojo de Agua, route 1 km 75, 30 June 1967, Flint and Ortiz. USNM Type 7076. *Paratype*: Same data, 1 male, 2 females; same, but 20 July 1967, 3 males, 2 females."

Material examined. **COSTA RICA:** Cartago, Ojo de Agua, Rt. 2, km 75, larvae & pupae, 2 male pupae, male, 30 VI 1967, OSF & Ortiz, (USNM).

Lepidostoma (Nosopus) Hoodi Group

This group comprises three species, *L. (N.) ermanae, hoodi*, and *spicatum*. The relationship of this species group to others remains elusive because of modifications in the male anterior wing. Interestingly, similar modifications in the male wing are exhibited by *Dinarthrella*. The male genitalia are similar to those of other species of *L. (Nosopus)*, to which this group is tentatively assigned.

Male. Antenna, scape modified, with mesal process or bend near its base; pedicel much longer than individual segments of flagellum. Anterior wing modified, having *Cu*2 apparently atrophied, thyridial cell 4/5 as long as wing, venation obscured by medial fold (f. 54). Posterior wing with *F*1 only, 1*A* and 2*A* fused. Genitalia (f. 92-94) similar to those of other species of *L. (Nosopus)*. Segment X tuberculate. Phallus symmetrical. Inferior appendage with first article acuminate, triangular; second article, small subapical mesal process; dorsal and dorsomesal process present.

Female. Female of *L. (N.) spicatum* unknown. Wings of *L. (N.) hoodi* typical of the family. Spermathecal sclerite in *L. (N.) ermanae* and *hoodi* narrow posteriorly and wider anteriorly, bell-shaped in ventral view (f. 119).

Immatures, case and habitat. The pupal cases of *L. (N.) hoodi* and *spicatum* in this group are known to be similar, cylindrical and composed of small stones, suggesting that their larvae construct stone cases only. Other than *L. (N.) hoodi* I have observed North American lepidostomatid larvae without abdominal gills only from the type locality of *L. (N.) ermanae* and a watershed where *L. (N.) spicatum* occurs; thus I predict that these larvae are of these two species which are closely related to *L. (N.) hoodi*. The presumed larvae of *L. (N.) ermanae* and *spicatum* inhabit springs; the larvae of *L. (N.) hoodi* dwell in streams and springs.

Distribution. Northwestern North America.

Lepidostoma (Nosopus) ermanae Weaver n. sp.

(f. 92, 118)

This species is included in the *L. (N.) hoodi* group of which it is more closely related to *L. (N.) spicatum*, having similar modifications of the male scape and pedicel. However, it differs by having male, segment X more slender, almost twice as long as its height in lateral view.

Male. Color light brown. Head vertex with median protuberance between antennae about a fourth as long as scape. Scape and pedicel similar to those of *L. (N.) spicatum* (f. 38); scape 0.4 mm long, stout, somewhat rectangular in dorsal view with mesal surface expanded and slightly bulbous; pedicel 0.3 mm long, with basomesal process, an extension of a mesal C-shaped cavity which bears many small setae; first segment of flagellum about half as long as pedicel. Maxillary palp apparently one-segmented and 0.6 mm long. Labial palp 0.95 mm long. Anterior wing 7.0 mm long, venation similar to that of *L. (N.) hoodi* with long setose fold along *M*. Posterior wing with venation different from that of *L. (N.) hoodi*, having *M* unbranched and *F*5 present. Genitalia (f. 92): Segment X in lateral view almost twice as long as basal height, dorsum curved toward triangular apex, venter more nearly straight with rounded, shallow, subapical emargination; in dorsal view having a pair of acuminate processes with their basal halves fused and distal halves separate, each separated by narrow V-shaped notch, and apices slightly curved and pointed laterally. Phallus with parameres more slender than in *L. (N.) spicatum* and more curved than in *L. (N.) hoodi* or *spicatum*.

Female. Genitalia (f. 118): Segment IX with anterior apodeme longer than in *L. (N.) hoodi*. Spermathecal sclerite similar to that of *L. (N.) hoodi*, but having length greater than its height in lateral view.

Immatures, case and habitat. One kind of larva was collected in abundance in a spring at the type locality and it is very probably of this species. Larva head and pronotum brown; pronotum in dorsal view with lateral margins curved and slightly broader than head; abdomen without gills. Case cylindrical and made of stones. Nancy Erman (pers. comm.) is conducting an ecological study of the spring habitat and has observed its water temperature 3.5-4.0°C.

Life history. A few early instar larvae (probably third of fourth instars) were collected 9 October. Recorded flight date: 24 July.

Distribution. Known only from the type locality in the northern Sierra Nevada Mountains of California.

Type material. *Holotype*: CALIFORNIA: Nevada Co: spring, northern slope of Sagehen Creek basin, 2000 m, emergence trap, male, 24 July 1984, NA Erman, (USNM). *Paratypes*: ibid, 6 males, 8 females, NA Erman: 3 males and 4 females, (USNM), 3 males and 4 females, (JSW).

Other material examined. Ibid, 9 October 1982, 7 larvae (probably third or fourth instars), NA Erman, (JSW).

Etymology. This species is named after its collector Nancy A. Erman in honor of her remarkable discoveries in trichopteran behavior and ecology.

Lepidostoma (Nosopus) hoodi Ross
(f. 37, 54, 93, 119)

Lepidostoma hoodi Ross 1948:152-153, pl. 14 f. 2-2A (male); Fischer 1970:57; Anderson and Wold 1972:192, 198; Anderson 1976:119; Nimmo and Scudder 1978:119; Webb 1980:97; Anderson et al. 1982:14; Nimmo and Scudder 1983:80; Anderson et al. 1984:15.

Male. Head (f. 37) with scape 1.0 mm long, bent mesad near base, setose. Maxillary palp fingerlike, apparently one-segmented, 1.2 mm long, setose. Wings (f. 54) brown. Anterior wing 8.2 mm long, highly modified with deep expansible medial fold. Genitalia (f. 93) with segment X in lateral view narrow and long, about twice as long as high. Phallus symmetrical.

Female. Wings (f. 54) with normal venation for lepidostomatid female. Genitalia (f. 119) with spermathecal sclerite unique, in lateral view height about twice as long as length; in ventral view anterior portion about three times wider than posterior.

Immatures, case and habitat. Larvae and pupae found in mountain stream and spring habitats. Case similar to that of *L. (N.) cascadense,* cylindrical and made of small stones.

Life history. Larvae collected 4 May to 20 July, 14 September; pupae 20 June to 14-23 August). Recorded flight dates: 21 May - 15 September.

Distribution. British Columbia, Oregon, and Washington.

Type data. Ross (1948): "*Holotype,* male. - Government Camp, 4000' elev., on south slope of Mt. Hood, Oregon, July 23, 1946, H. H. Ross. *Paratype.* - Hood River Meadows, Mt. Hood, Oregon, July 17, 1947, Kenneth M. Fender." Holotype at the INHS (Webb 1980). Paratype also at the INHS (pers. comm. J. D. Unzicker).

Material examined. OREGON: Mt. Hood, N Fork Iron Cr, Rt 35, near Government Camp, 8 pupae, 20 VI 1968 (2 emerged 23 VIII, preserved 26 VIII), GBW, TY, SDS, (ROME); Benton Co: 6.75 mi N of Corvallis, Oak Cr, 2 males, 27 VIII-3 IX 1968, CD Kent, (USNM); ibid, trap at right branch of Oak Cr, E side of Patterson Rd, 1.5 mi N of Fisheries Lab, 700', male, 4-8 IX 1970, C Kerst, (OSUO); Marys Peak, Parker Cr, at Summit Cpg, 2 larvae, 14 IX 1981; larva, 30 V 1982, RWW, (OSUO); Zahn Cr, headwaters at FS road, on leaf, larva, 20 VII 1981, RWW, (OSUO); Lincoln Co: Flynn Cr, weir str springhead in seep, 11 larvae, 22 V 1982, RWW, (OSUO); ibid, gate trib, 3 larvae, 6 VII 1982, RWW, (OSUO); ibid, gauge trib, larva, 6 VII 1982; larva, 4 V 1982; male, 21-22 V 1982, RWW, (OSUO); Linn Co: 1 mi W of Marion Forks, N Santiam Hwy, 3 males, 9 VIII 1952, K Fender, (INHS); Tombstone, male pupa, 14 VIII 1982, RWW, (OSUO); Union Co: 2 mi N of Elgin, Gordon Cr, 4 larvae, 12 VI 1974, NHA, (OSUO). **WASHINGTON:** Chelan Co: 11 mi W of Wenatchee Lake, Minotaur Cr, males & females, 1-15 IX 1976, JRW (SDS).

Lepidostoma (Nosopus) spicatum Denning
(f. 38, 94)

Lepidostoma spicata Denning 1954:190, f. 4A-C (male); Newell and Potter 1973:20; Roemhild 1982:11.
Lepidostoma spicatum: Fischer 1970:64.
Lepidostoma roemhildi Denning 1982:214-215, f. 13, 13A-D (male) NEW SYNONYM.

Male. Head (f. 38) having scape about 0.8 mm long, modified with slender curved mesal process (Denning 1954: f. 4C). Maxillary palps slender and spatulate, 1.1 mm long. Anterior wing 7.6 mm long, similar to *L. (N.) hoodi.* Genitalia (f. 94) with segment X in lateral view having height about equal to length, with several pointed tubercles.

Female. Unknown.

Immatures, case and habitat. A few specimens examined were collected from a spring habitat. The case is similar to those of *L. (N.) hoodi* and *cascadense*.

Life history. Larvae collected 14 to 22 June, pupa preserved 12 July. Recorded flight date: 21 - 29 July.

Distribution. Alberta, Idaho, Montana, and Utah.

Type data. *Lepidostoma spicata* Denning (1954): "*Holotype*, male, Twin Creek Camp, Bitterroot Mountains, Salmon, Odaho, 5000' elevation, July 25, 1952, Borys Malkin. *Paratype*, male, same data as for holotype." See type material examined below.

Lepidostoma roemhildi Denning (1983): "*Holotype*, male. - Montana: Sanders County, 10 miles NE Thompson Falls, West Fork Thompson River, 25 July 1975, George Roemhild. *Paratype*, male. - Glacier County, Montana, Many Glacier Area, small seeps along Iceberg Lake Trail, 21 July 1979, R. W. Baumann of Brigham Young University, Provo, Utah."

Material examined. **ALBERTA:** Banff roadside spring on Sundance Canyon Rd, 2 immatures, 22 VI 1962 (reared male pupa, preserved 12 VII-29 VIII), GBW, (ROME). **IDAHO:** Lemhi Co: Salmon, Bitterroot Mountains, Twin Creek Camp, 5000', male (paratype of *spicatum*, 25 VII 1952, B Malkin, (DGD). **MONTANA:** Gallatin Co: West Cr, 2 larvae, 14 IV 1985, DLG, (JSW); Bozeman Cr, male, 29 VII 1986, DLG, (JSW).

Lepidostoma (Nosopus), Incertae Sedis

The species group positions of the following three species of *L. (Nosopus)* are uncertain.

Lepidostoma (Nosopus) cascadense (Milne)
(f. 13, 36, 55, 95, 117)

Jenortha cascadensis Milne 1936:119, 121, 124 (male); Webb 1980:97.

Lepidostoma pleca Ross 1938a:175-176, f. 118 (male); Webb 1980:98.

Lepidostoma cascadense: Fischer 1970:40; Anderson 1976:118; Schmid 1980:150, f. 530, 540, 543, (male), (*cascadis* p. 256); Grafius and Anderson 1980:808-816; LaFontaine 1981:251; Roemhild 1982:11; Baumann and Unzicker 1981:27; Anderson et al. 1982:14; Anderson et al. 1984:15, 17, 18; Nimmo and Wickstrom 1984:4; Ruiter and Lavigne 1985:41; Herrmann et al. 1986:434; Nimmo 1986a:2.

Lepidostoma cascadensis: Newell and Potter 1973:20; Nimmo and Scudder 1978: 119; Nimmo and Scudder 1983:80.

Lepidostoma mira Denning 1954:189-190, f. 3A-D (male, female) NEW SYNONYM; Smith 1969:52; Fischer 1970:60; Anderson 1976:119; Baumann and Unzicker 1981:27; Anderson et al. 1982:14; Ruiter and Lavigne 1985:42; Herrmann et al. 1986:434.

This is the only North American lepidostomatid of which both the male and female can be recognized on the bases of wing venation alone.

Male. Scape 0.8 mm long, with mesal lobe bearing many stout setae; maxillary palp 1.0 mm long, with apical segment spatulate and flexible; mesoscutellum with small setose warts (f. 36). Wings (f. 55) light brown and very narrow. Anterior wing, 8.0 mm long, venation unique, with submarginal anal grove transecting *Cu*1, 1*A*, 2*A*, 3*A* and each vein terminating in apical margin independently; *R*5 and *Ma* forming petiolate apical fork; with many modified setae (f. 13). Genitalia (f. 95) having segment X in lateral view with dorsum short and curved ventrad, venter longer and somewhat linear, apex pointed and bearing many dorsal tubercles. Phallus symmetrical. Parameres with several basodorsal tubercles.

Female. Anterior wing venation unique, with *F*1, *F*2, *F*3, and *F*5; *R*5 and *M*1 forming petiolate fork (similar configuration as in male). Genitalia (f. 117) in lateral view similar to those of *L. (N.) roafi*. Segment IX with short posterior apodeme and curved ventroapical notch. Spermathecal sclerite in lateral view with height greater than length, in ventral view oval, with length greater that width.

Immatures, case and habitat. Larva unique, metanotal *sa*1 and *sa*2 sclerites large, oval, each bearing 15-20 setae. Contributions to the life history of *L. (N.) cascadense* have been documented by Anderson (1976), Grafius and Anderson (1980). Cases of all larval instars cylindrical and composed of small stones. Larvae inhabit mountain streams and rivers.

Life history. Larvae have been collected from September to the end of July, pupae from mid-June to the end of July. Recorded flight dates: 14 May - 10 October.

Distribution. Alberta, Alaska, British Columbia, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming, and Yukon.

Type data. *Jenortha cascadensis* Milne (1936): "*Holotype*, male, 1 male *paratype* 'Cultus L., B. C., 8-VII-1934, W. E. Ricker,' 1 male same data but 28-V-1935, all in the author's collection." Holotype at the INHS (Webb 1980). See type material examined below.

Lepidostoma pleca Ross (1938a): "*Holotype*, male. - Ingles Creek (near Bluett Pass), Washington: July 10, 1936, H. H. Ross." Holotype at the INHS (Webb 1980). See type material examined below.

Lepidostoma mira Denning (1954): "*Holotype*, male, Strawberry, Tuolumne County, California, July 8, 1951, E. L. Silver. *Allotype*. - female, same data as for holotype. *Paratype*, males, 1 male, same data as for holotype; 1 male, Castle Lake, Siskiyou County, California, Harry Chandler. Holotype deposited in the collection of the University of California, Berkeley, California." See type material examined below.

Material examined. Holotype male, paratypes male and female of *J. cascadensis*, (INHS); paratypes 2 males of *L. mira*, (DGD); holotype male of *L. pleca*, (INHS). ALBERTA: Bread Cr, Forestry Trunk Road, N of Coleman, male, 2 females, 17 VII 1976, APN, (UASM); Cameron Cr, WNP, 5400', male, 26 VII 1975, DB Donald, (UASM); Cameron Cr Falls, Waterton, male, 2 VIII 1968, APN, (UASM); Crowsnest R, Frank, male, 12 VIII 1967, APN, (UASM); Ernst Cr, Maycroft, Gap Rd, male, 5 IX 1976, APN, (UASM); Galway Bk, Hwy 6, S of Pincher Cr, male, 31 VII 1976, APN, (UASM); McLeod R, Forestry Trunk Road, S of Hinton, male, 25 VII 1976, APN, (UASM); Shunda Cr, 2-3 mi E of Nordegg, male, 8 VIII 1965, APN, (UASM). BRITISH COLUMBIA: Bella Coola R, Hwy 20, W of Anahim Lake, male, 15 VII 1976, APN, (CNCI); 44.6 mi W of Burns Lake, Hwy 16, male, 3 females, 18 VII 1979, APN, (CNCI); W of Endako, Hwy 16, 2 males, female, 18 VII 1979, APN, (CNCI); 13 km E of Hope, Hwy 3, male, 13 VII 1979, APN, (CNCI); W of Keremeos, Sixteen-mile Cr, Hwy 3, 2 males, female, 5 VIII 1979, APN, (CNCI); Rock Creek, Hwy 3, Rock Cr, male, 3 VIII 1979, APN, (CNCI); 3.3 km S of Squamish, Hwy 99, male, 12 VII 1979, APN, (CNCI); 5.7 km S of Squamish, Hwy 99, 3 males, 12 VII 1979, APN, (CNCI); Stone Creek, Hwy 97, Stone Cr, male, 17 VII 1979, APN, (CNCI); 5 km W of Topley, Hwy 16, 5 males, 5 females, 18 VII 1979, APN, (CNCI); Vancover Island: 74.9 km S of Beaver Cove, Hwy 19, 2 males, 2 females, 10 VII 1979, APN, (JSW) (CNCI); 24.1 km S of Beaver Cove, E side of Nimpkish Lake, Hwy 19, 10 VII 1979, male, APN, (CNCI); 24 km SW of Franklin R, Bamfield Rd, male, 7 VII 1979, APN, (CNCI); 28 km N of Gold River, male, female, 9 VII 1979, APN, (CNCI); 10 km W of Honeymoon Bay, male, 7 VIII 1979, APN, (CNCI); S of Courtney, Hwy 19, Tsable R, male, 8 VII 1979, APN, (CNCI); Kelsay Bay, 2 males, 9 VII 1979, APN, (CNCI). CALIFORNIA: Calaveras Co: male, female, 17 VII 1973, DRG & SDS, (SDS); El Dorado Co: Pyramid Sta, Hwy 50, male, 16 VII 1973, DRG & SDS, (SDS); Fresno Co: Dinkey Cr, male, 10 IX 1983, RD Haines, (DGD); Mono Co:

Convict Cr, male, 17 VII 1963, HDK, (USNM); Yosemite Natl Pk, Mosquito Cr, male pupa, 17 VI 1961, GBW, (ROME); Tuolumne Co: Crabtree Cpg, 7000', 11 mi E of Pinecrest, Bell Cr, 2 males, 17 VII 1973, DRG & SDS, (SDS). **COLORADO**: Boulder Co: Middle Boulder Cr, Hwy 119, Barker Res, 4 males, 6 VIII 1973, RSB & WPS, (USNM); 12 mi W of Boulder Cr, male, female, 10 VIII 1973, DLP & SDS, (SDS); Chaffee Co: Buena Vista, 2 males, 9 VIII 1973, DLP & SDS, (SDS); Clear Creek Co: Idaho Springs, Clear Cr, male, female, 5 VIII 1973, RWB & WPS, (USNM); Gunnison Co: 14 mi W of Crested Butte, male, 7 VIII 1972, KWS, (USNM); Larimer Co: Rocky Mts Natl Pk, Hwy 34, Fall River, male, 24 VII 1960, ARG, (USNM); ibid, Roaring R, 3 males, 2 females, 11 VIII 1973, DLP & SDS, (JSW). **IDAHO**: 1 mi SE of Lolo Summit, Pack Cr, male, 21 VII 1963, SDS, (UICM); Boundary Co: Long Canyon Cr, male, 12 VIII 1965, WFB, (UICM); Idaho Co: N Riggins, John Day Cr, male, 17 VII 1964, SDS, (UICM); Latah Co: Moscow, Chmarine Cr, male, 14 VII 1963, SDS, (UICM). **MONTANA**: Glacier Natl Pk, Trick Falls Cr, 2 males, 3 VII 1940, JAR & HHR, (INHS); Gallatin Co: West Cr, 2 larvae, 14 IV 1985, DLG, (JSW); Madison Co: S Willow Cr, 33 larvae, 6 IV 1986, DLG, (JSW). **NEVADA**: Washoe Co: Galena Cr, Whochoe Co Recreation Area, Hwy 27, 2 males, 31 VII 1968, RWB, (USNM). **OREGON**: Mt. Hood, Still Cr, Forest Camp, male pupa, 17 VII 1963 (preserved 6 VIII), GBW, (ROME); Baker Co: Spring Cr, male, female, 7 VII 1963; male, 2 females, 16 VIII 1969; male, female, 6 IX 1968, JHB, (USNM); Big Lookout Mt., 13 VII 1974, JHB, (USNM); Lane Co: Grasshopper Cr, larva, 23 V 1982, RWW, (OSUO); Lincoln Co: Flynn Cr, 2 larvae, 29 I 1982; 4 larvae, 7 III 1982; ibid, immatures on cobble below bedrock collected 5 V 1982 female emerged 14 V), RWW, (OSUO). **UTAH**: Summit Co: Smith & Morehouse Cr, S fork Grand Station, male, 19 VII 1961, ARG, (USNM); Utah Co: Timpanagos St Pk, male, 7 females, 14 VII 1972, CED, (CUCC). **WASHINGTON**: Chelan Co: Little Wenatchee River, 29 mi W of Leavenworth, 2 males, 24 VIII 1980, SDS, (SDS); Clallam Co: Elwah River, Olympic Natl Pk, male, 4 females, 9 VIII 1969, SDS, (SDS); Kittitas Co: Kachess Cp, Gale Cr, male, 25 VIII 1970, SDS, (SDS); 2 mi N of Little Kachess Lake, 2 males, 10 VIII 1971, SDS, (SDS); Lewis Co: 10 mi S of Randle, Camp Cr, male, 2 VII 1980, SDS, (SDS). **YUKON**: 32.6 km W of Teslin Bridge, Alaska Hwy, Seaforth Cr, male, 24 VII 1979, APN, (UASM).

Lepidostoma (Nosopus) verodum Ross
(f. 39, 56, 96, 120)

Lepidostoma veroda Ross 1948:151-152, pl. 14 f. 1-1A (male); Fischer 1970:69; Anderson 1976:124; Webb 1980:98; Anderson et al. 1982:14; Anderson et al. 1984:15.

Male. Head (f. 39) with appendages highly modified. Scape bulbous, about 1.0 mm long. Maxillary palps, two-segmented, base bulbous and bearing long tuft of setae dorsad, apex broad and fingerlike, 1.5 mm long. Wings (f. 56) brown. Anterior wing 7 mm long, venation similar to *L. (N.) unicolor*, but with small anal setose groove. Posterior wing similar to that of *L. (N.) roafi*, but fork of *M* longer, about 2/3 length of wing. Genitalia (f. 96) similar to those of *L. (N.) roafi*. Segment X in lateral view, having dorsum with oblique posterior angle and ventral apex truncated. Parameres about half as long as phalicata. Inferior appendage short, acuminate, about as long as segment X, with dorsal process shorter than mesal process.

Female. Genitalia (f. 120) similar to those of several other species of *L. (Nosopus)*. Spermathecal sclerite oval in ventral view.

Immatures, case and habitat. The adult-larval association of this species is not certain. However, based on the process of elimination of larvae known from other *Lepidostoma* species groups in the West and specimens provided by R. W. Wisseman, the larvae is tentatively identified as the one which makes a spiral case as depicted by Wiggins (1977: f. 8.1 G). A few such larvae were found inhabiting small mountain streams on wood debris.

Life history. Probable larvae collected 4 April to 10 June. Recorded flight dates: 17 July - 13 September.

Distribution. Northern California, Oregon, and Washington.

Type data. Ross (1948): "*Holotype*, male; Hood River Meadows, Mt. Hood, Oregon, July 17, 1947, Kenneth M. Fender." Holotype at the INHS (Webb 1980).

Material examined. **CALIFORNIA:** Nevada Co: Sagehen Cr at spring tributary, 6400', 2 males, female, 20 VIII 1965, A Sheldon, (JSW); 3 males, 8 females, 11 VIII 1965 (JSW); 11 males, 7 females, 13 IX 1965; A Sheldon, (USNM). **OREGON:** Benton Co: Marys Peak, in drainage area of road cut near Parker Creek Falls near summit, 3 larvae?, 4 IV 1981, RWW, (OSUO); Jefferson Co: stream going into Metolius branch of Billy Chinook reserv, on wood, larva?, 10 VI 1978, TL Dudley, (OSUO); Lane Co: HJ Andrews Exp Forest, Mack Cr, 2 males, 20 VII 1982; male 28 VII 1982, RWW, (OSUO).

Lepidostoma (Nosopus) deceptivum (Banks), *nomen dubium*
(f. 121)

Thremma deceptiva Banks 1907:125, pl. 8 f. 1, (female).
Lepidostoma deceptivum: Fischer 1970:41.

The male of this species remains unassociated with its female. Additional species associations of male and female lepidostomatids from the Southwest are necessary to reveal the unknown male of *L. (N.) deceptivum*. I have examined the female holotype, clearing and illustrating its genitalia for the first time.

Female. Genitalia (f. 121) somewhat similar to those of *L. (N.) bakeri* and *knulli*, but connective tube between spermatheca and spermathecal sclerite more narrow and not as bulbous as in these species. However, this may or may not be a reliable distinction.

Male, immatures, case, habitat, and life history. Unknown.

Distribution. New Mexico. Only known from the type locality.

Type data. Banks (1907): "One female from Beulah, New Mexico, 8,000 feet (Cockerell)."

Thremma deceptiva Banks, *New Lectotype*, male; Beulah, New Mexico, 8,000 feet, MCZC "Type 11706."

Material examined. Lectotype female, no date on label, (MCZC).

Lepidostoma Subgenus *Mormomyia* Banks

Mormomyia Banks 1907:127, type species: *Mormonia vernalis* Banks (monobasic).
Phanopsyche Banks 1911:357, type species: *grisea* Banks (monobasic).

Etymology: Greek, *mormo*, bugbear, hobgoblin; *myia*, fly.

This subgenus comprises 15 known species, including species formerly of the *L. vernalis* group *sensu* Ross (1946). Adults of both sexes are distinguished by having abdominal segment IX with a dorsal pair of setose warts (f. 125-148). Flint and Wiggins (1961) and Wallace and Sherberger (1972) have made contributions to the systematics of this group.

Male. Head (f. 122, 124) with scape 0.5-0.6 mm long, shorter than head, not highly modified, cylindrical. Maxillary palp 0.5-0.8 mm long, segmentation reduced, apparently with only one segment, fingerlike, slender and somewhat linear, except in *L. (M.) griseum* group angled mesad (f. 122). Mesonotum of *L. (M.) griseum* bears several stout setae (f. 11). Wing venation different from that of female (f. 125, 126). Anterior wing unique, with thyridial cell petiolate, being very narrow basad and broad distad, with *F*5 and each of its adjacent open cells subequal in length; both anal cells usually present, except in modified anterior wing of *L. (M.) griseum* group with long setose submarginal anal groove. Posterior wing with *F*1 and sometimes *F*2 present, *M* and *Cu*1 unbranched, 1*A* and 2*A* completely fused. Hindwing of *L. (M.) griseum* group with submarginal anal groove aligned with posterior margin of anterior wing in lateral position. Genitalia (f. 127-141) having segment IX with pair of dorsal setose warts. Terga of other posterior abdominal segments bearing many long setae. Unique massive egg-shaped dorsum of abdominal segment IX in *L. (M.) sackeni*, possibly enlarged modification of dorsal setose warts. Segment X dorsum large, somewhat circular, lobelike process only in *L. (M.) griseum* group; in other groups dorsum absent and with only ventrolateral processes (usually bifid). Anus opens from large membranous lobe below abdominal segment X. Phallus asymmetrical (except in *L. [M.] vernale* group), endothecal membrane and phallocrypt large and bulbous. Inferior appendage similar to that of *L. (Nosopus)* species, having vertical basodorsal and horizontal middorsal processes; second article in subapical mesal position, but first article acuminate and triangular in lateral view,

Female. Wings typical (f. 125, 126). Genitalia (f. 142-150) having segment IX with pair of dorsal setose warts. Spermathecal sclerite sometimes pointed posteriorly. Ventral sclerite of oviduct with posterior margin crenate or with several apical ridges. Key for females of several species provided by Flint and Wiggins (1961:281).

Immatures, case and habitat. Larvae of most species are endemic to springs, but some occur in small streams. All known immatures apparently construct panel cases (f. 4) during final instar, except species of the *L. (M.) libum* group which predominantly construct stone cases (f. 2).

Distribution. *L. (Mormomyia)* occurs throughout most of eastern North America and is especially diverse in the Appalachian Mountains.

Key to Adults of *L. (Mormomyia)* Species
(males)

1a. Dorsum of segment IX ovoid, extended posteriorly beyond segment X (f. 137); West Virginia to Newfoundland to Wisconsin .... *sackeni* (Banks), p. 71.
1b. Dorsum of segment IX, not bulbous nor extended beyond segment X (f. 127-136) 2

2a. Maxillary palp angled (f. 122); warts of segment IX oval and aligned transversely; (f. 127, 128); *griseum* group 3
2b. Maxillary palp straight (f. 124); warts on dorsum of segment IX round (f. 129-141) 4

3a. Mesonotal warts bearing many stout androconia (f. 122); posterior ventral process of segment X short, not extended far beyond hind margin in lateral view (f. 127); Georgia to Nova Scotia, Tennessee to Wisconsin .... *griseum* (Banks), p. 63.
3b. Mesonotal warts with normal setae (f. 123); posterior ventral process of segment X long, extended far beyond hind margin in lateral view (f. 128); Florida to Mississippi .... *morsei* Weaver, p. 64.

4a. Segment X with dorsomesal hump-shaped flange extended posteriorly over large membranous anal lobe in dorsal view (f. 130, 131) 5
4b. Segment X without dorsomesal flange extended over anal lobe in dorsal view (f. 129, 132-141) 6

5a. Phallic parameres spiniform, subequal in length (f. 130); Louisiana, North Carolina, and Connecticut .... *serratum* Flint & Wiggins, p. 66.
5b. Phallic parameres broad, not spiniform, unequal in length, right paramere about twice as long as left one (f. 131); Tennessee .... *etnieri* Weaver, p. 67.

6a. Right paramere spade-shaped in dorsal view, left paramere small and obscure; segment X in dorsal view with two short, straight, slender, mesal processes, without long lateral processes (f. 129); South Carolina to Maine .... *carrolli* Flint, p. 65.
6b. Right paramere in dorsal view not spade-shaped, subequal to left paramere; segment X in dorsal view with curved lateral processes or with long, curved, mesal processes (f. 132-141) 7

7a. Segment IX with large setose warts, covering most of dorsum (f. 135, 136, 138); *vernale* group (in part) 8
7b. Segment IX with small setose warts not covering most of dorsum (f. 132-134, 139-141) 10

8a. Segment X in lateral view with short dorsolateral process and longer curved ventrolateral rod (f. 138); Virginia to Newfoundland to Wisconsin .... *vernale* (Banks), p. 72.
8b. Segment X in lateral view with long dorsolateral process and shorter ventrolateral process (f. 135) 9

9a. Basodorsal process of inferior appendage long, extending posteriorly as far as apex of middorsal process (f. 135); mountains of North and South Carolina .... *flinti* Wallace & Sherberger, p. 70.
9b. Basodorsal process of inferior appendage short extending posteriorly as far as base of middorsal process (f. 136); Georgia .... *glenni* Wallace & Sherberger, p. 71.

10a. Inferior appendages in dorsal aspect with small pair of mesal hooks near V-shaped notch of posterior margin, in lateral aspect without subapical vertical process (f. 140); *mitchelli* group 11
10b. Inferior appendages in dorsal aspect without small pair of mesal hooks near notch of posterior margin, in lateral aspect with subapical vertical process (f. 132-134); *libum* group 13

11a. Dorsal aspect of inferior appendages with broad squarely truncated apices, phallus symmetrical (f. 140); mountains of North Carolina and Tennessee .... *mitchelli* Flint & Wiggins, p. 74.
11b. Dorsal aspect of inferior appendages with oblique apices; phallus asymmetrical (f. 139, 141) 12

12a. Main article of inferior appendage broad, obscuring most of middorsal process in lateral view (f. 141); Appalachian Mountains of North and South Carolina .... *styliferum* Flint & Wiggins, p. 74.
12b. Main article of inferior appendage slender, not obscuring middorsal process in lateral view (f. 139); Appalachian Mountains of Georgia .... *lobatum* Wallace & Sherberger, p. 73.

13a. Lateral aspect of inferior appendage with large subapical vertical process (f. 132); mountains of North Carolina and Tennessee .... *excavatum* Flint & Wiggins, p. 67.
13b. Lateral aspect of inferior appendage with small subapical vertical process (f. 133, 134) 14

14a. Inferior appendage with short curved basodorsal process, about a fourth as long as main process (f. 134); Virginia to New Hampshire to Indiana .. .. *sommermanae* Ross, p. 69.
14b. Inferior appendage with long curved basodorsal process, about half as long as main process (f. 133); Illinois to Wisconsin .... *libum* Ross, p. 68.

Lepidostoma (Mormomyia) Griseum Group

This group comprises two species, *L. (M.) griseum* and *morsei*.

Male. Maxillary palps angled in front of face (f. 122). Wings (f. 125) having anterior wing, highly specialized with posterobasal setose pocket. Posterior wing modified with posterior submarginal setose groove. These modified sites overlap each other when both wings are spread laterally and probably function in pheromone dispersion. Genitalia (f. 127) having segment IX with pair of elongate oval, dorsal setose warts. Segment X in lateral view with large circular dorsum and two ventrolateral processes. Phallus asymmetrical, parameres diverging to left side of phalicata. Inferior appendages with first article acuminate in lateral view and with apex curved mesad in ventral view; basodorsal process shorter than middorsal process; second article, subapical mesal point.

Female. Genitalia (f. 142) having segment IX with small setose wart; spermathecal sclerite in ventral view broad posteriorly and curved anteriorly.

Immatures, case and habitat. Final instars of *L. (M.) griseum* construct panel cases.

Distribution. Widespread, eastern North America.

Lepidostoma (Mormomyia) griseum (Banks)
(f. 11, 122, 125, 127, 142)

Phanopsyche grisea Banks 1911:357-358, pl. 12 f. 17, 19, 22 (male).
Lepidostoma griseum: Flint and Wiggins 1961:280, 281, 290-292, f. 9A-B, 19 (male, female); Ellis 1962:5, 14; Blickle and Morse 1966:11; Wray 1967, p 56; McConnochie and Likens 1969:150; Fischer 1970:43; Hilsenhoff et al. 1972:22, 28; Wallace and Sherberger 1972:227; Longridge and Hilsenhoff 1973:180; Resh 1975:15; Roy and Harper 1975:1084; Hilsenhoff 1975:25; Seward and Swegman 1978:24; Neves 1979:171; Roy and Harper 1979:162; Etnier and Schuster 1979:19; Tarter and Hill 1979:206; Masteller and Flint 1979:169, 174; Karl and Hilsenhoff 1979:33, 40-41; Masteller and Flint 1980a:18, 19, 21; Masteller and Flint 1980b:202, 207; Swegman et al. 1981:131, 144; LaFontaine 1981:251; Unzicker et al. 1982:9.106, 9.107; Huryn and Foote 1983:792; Lake 1984:221; Singh et al. 1984:225; Steven and Hilsenhoff 1984:165.
Lepidostoma grisea: Herrmann et al. 1986:434.

Male. Head (f. 122) with scape 0.5 mm long, simple. Maxillary palps angled mesad, 0.8-1.0 mm long. Mesonotum (f. 11) modified with many stout setae, mesoscutum with setose warts larger than those of *L. (M.) vernale*. Tibial spurs (f. 11). Wings (f. 125). Genitalia (f. 127) similar to *L. (M.) morsei*. Tergum IX with oval, transverse, setose warts. Segment X in lateral view with circular dorsum and two short ventroapical processes. Phallus asymmetrical, right paramere sinuate, endothecal membrane large bulbous. Inferior appendage typical of *L. (M.) griseum* group.

Female. Wings (f. 125). Genitalia (f. 142) similar to those of *L. (M.) sackeni*; however, segment IX with smaller setose wart. Spermathecal sclerite in lateral view with small dorsal lobe; in ventral view oval, posteriorly elongated laterally. Ventral sclerite of vulva with several apical striations.

Immatures, case and habitat. Final instar larvae construct panel case square in cross-section composed of hexagonal pieces of bark. Flint and Wiggins (1961) and Karl and Hilsenhoff (1979) reported on the life history of *L. (M.) griseum*. Larvae appear to be endemic to small second order streams.

Life history. Larvae collected 6 October to 28 July, pupae 14 July to 6 September. Recorded flight dates: 20 June - 27 September.

Distribution. Delaware, Georgia, Kentucky, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Nova Scotia, Ohio, Ontario, Pennsylvania, Quebec, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin. (A record from Colorado [Herrmann et al. 1986] is probably in error [pers. comm. D. E. Ruiter].)

Type data. Banks (1911): "From Woodworth's Lake, Fulton County, New York, 22 August and 14 September (Alexander coll.)." Ross (1938b): "*Lectotype*, male, Woodworth's Lake, Fulton Co., New York, August 22, No. 11693." I have seen the lectotype and one syntype at the MCZC.

Material examined. **MICHIGAN**: Cheboygan Co: Niggor Cr at Indian Trail, male pupa (reared), 14 VII 1968, D Merrill, (ROME). **NEW YORK**: Tompkins Co: Dryden, Ellis Hollow, male, 6 IX 1956, OSF, (USNM). **NORTH CAROLINA**: Haywood Co: Great Smoky Mts Natl Pk, Chestnut Branch at Big Creek Cpg, 12 males, 5 females, 21-22 VIII 1982, JSW, (JSW); Macon Co: Nantahala Natl Forest, Standing Indian Cpg, male pupa, 4 larvae, 28 VII 1979, JCM, (CUCC); 35° 5' N 83° 14' 30" W, 2nd order stream, 2 male pupae, female pupa, RD Davie, (JSW); Swain Co: Great Smoky Mts Natl Pk, Mingus Cr, male, 9-10 IX 1983, JSW, (JSW); Yancey Co: Black Mts, 4760', Hemphill spring, male, 8 females, 2-3 IX 1978, JSW, (JSW). **NOVA SCOTIA**: Lunenburg Co: Petite River, New Cumberland Road, 9 males, 4 IX 1956, male, female, 5 IX 1956, DC Ferguson, (USNM). **PENNSYLVANIA**: Erie Co: Behrend College, male, 20 IX 1976; male, female, 29 VIII-5 IX 1977, ECM, (USNM); Six Mile Cr, 2 males, female, 26 VIII 1979, ECM, (USNM); Forest Co: Pigeon, Marienville Rod & Gun Club, 2 males, 28-29 VII 1976, JSW, (JSW); Sommerset Co: Laurel Hill St Pk, Jones Mill Run, male, 20-21 VIII 1976, JLS & JSW, (JSW); Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, 6 males, 10 females, 10-11 IX 1975, JSW & JLS, (JSW); Laughington, Laurel Summit Rd, Spruce Run, male, 21-22 VI 1976; male, 20-21 VIII 1976; 13 males, 7 females, 25-26 IX 1976, JSW, (JSW); Linn Run St Pk, Linn Run, male, 25-26 IX 1976, JSW, (JSW). **SOUTH CAROLINA**: Oconee Co: E fork Chattooga River, U.S. Fish Hatchery, male, 13 VIII 1969, JCM, (CUCC); Pickens Co: Wildcat Cr, 5 mi NW of Clemson, male, 21-22 X 1979, JSW, (JSW); 4 males, 26-27 IX 1968, JCM, (CUCC); Table Rock St Pk, Carrick Cr, male, 9 IX 1969, JCM, (CUCC). **TENNESSEE**: Blount Co: Great Smoky Mts Natl Pk, Rabbit Cr, 11 males, 9 females, 22-23 VIII 1982, JSW & PJS, (JSW). **VIRGINIA**: Prince William Co: Prince William Forest Park, male, 14 IX 1973, RWB, (USNM).

Lepidostoma (Mormomyia) morsei Weaver n. sp.
(f. 123, 128)

This species is closely related to *L. (M.) griseum*, but its male is distinguishable, having mesonotum not bearing stout, modified setae and segment X with longer ventrolateral processes in lateral view. Presently, this is the only lepidostomatid known from Florida.

Male. Scape and maxillary palps similar to those of *L. (M.) griseum*. Mesonotal warts (f. 123) not bearing modified, stout setae as in *L. (M.) griseum*. Wings modified similarly as those of *L. (M.) griseum*. Forewing 7.0 mm long. Genitalia (f. 128) similar to those of *L. (M.) griseum*. Tergum IX with oval setose warts. Segment X dorsum circular and smaller than that of *L. (M.) griseum*, with two ventrolateral processes in lateral view more than half as long as the dorsum and longer than those of *L. (M.) griseum*. Phallus asymmetrical, with broad parameres. Inferior appendage similar to that of *L. (M.) griseum*, but with more slender basodorsal process.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 18 - 19 October.

Distribution. Florida to Mississippi.

Type material. *Holotype*: **MISSISSIPPI**: Stone Co: U.S. Forest Lands, male, 19 October 1984, PK Lago, (USNM). *Paratype*: **FLORIDA**: Walton Co: Portland, Little Alaqua Cr, male, 18 October 1970, PHC, (JSW), (some of the locality information as labeled is questionable [pers. comm. K. L. Manuel]).

Etymology. This species is named after John C. Morse in honor of his guidance, encouragement, and support in the completion of this work.

Lepidostoma (Mormomyia) Serratum Group

This group comprises three species, *L. (M.) carrolli, serratum,* and *etnieri*.

Male. Maxillary palp slender, fingerlike, linear. Wings without secondary modification as in *L. (M.) griseum*; venation similar to that of *L. (M.) vernale*. Genitalia (f. 129-131) having tergum IX with round dorsal warts. Segment X in dorsal view with short dorsomesal projection (except absent in *L. [M.] carrolli*) and lateral processes not bifid. Phallus asymmetrical. Parameres separate, not fused basally, each markedly dissimilar in size with right paramere more than twice as large as left one in *L. (M.) carrolli* and *etnieri*.

Female. Females of *L. (M.) carrolli* and *serratum* known (f. 143).

Immatures, case and habitat. Only larvae of *L. (M.) serratum* known whose final instars construct a cigar-shaped, panel case and inhabit springs.

Distribution. Louisiana to South Carolina to Tennessee to Connecticut.

Lepidostoma (Mormomyia) carrolli Flint
(f. 129)

Lepidostoma carrolli Flint 1958:22-24, f. 4A-F (male, female); Flint and Wiggins 1961:279, 281, 292-293, f. 8A-B, 8D, 15 (male, female); Blickle and Morse 1966:11; Fischer 1970:40; Wallace and Sherberger 1972:227; Etnier 1973:274; Etnier and Schuster 1979:19; Masteller and Flint 1979:169; Morse et al. 1980:91; Unzicker et al. 1982:9.106, 9.107; Huryn and Foote 1983:792.

Male. Scape 0.6 mm long. Maxillary palp 0.7 mm long. Wings similar to those of *L. (M.) vernale*. Anterior wing 6.5 mm long. Genitalia (f. 129) having tergum IX with small pair of round setose warts. Segment X in lateral view, with dorsum extending posteriorly, venter short, irregularly shaped and slanted obliquely towards dorsal apex. Parameres in dorsal view with right paramere spade-shaped, left paramere an obscure small point. Inferior appendage in lateral view with basodorsal process short, broad and pointed apically, and seated on long horizontal middorsal process; first article slender and extending posteriorly just beyond horizontal middorsal process.

Female. Genitalia (Flint and Wiggins 1961: f. 15) with ventral sclerite of oviduct in ventral view extending beyond sternite VIII and bilobed.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 28 July - 16 October.

Distribution. Maine, Maryland, New Jersey, Ohio, Pennsylvania, South Carolina, and Tennessee.

Type data. Flint (1958): "*Holotype*, male, Lakehurst, New Jersey, September 4, 1956, C. B. Knowlton, Jr. and J. G. Franclemont; *allotopotype*, female, September 1, 1956; deposited in the Cornell University collection.

Paratopotypes: Aug. 25, 1 male; Aug. 26, 4 males; Aug. 30, 1 male, 1 female; Sept. 1, 1 male; deposited in the collections of U.S. National Museum, Illinois Natural History Survey, Dr. D. G. Denning and author." See type material examined below.

Material examined. MARYLAND: Prince Georges Co: Beltsville, 2 males, 16-30 IX 1964, PH Arnaud, (CASC). NEW JERSEY: Ocean Co: Lakehurst, paratype male, 1 IX 1956, CB Knowlton & JG Franclemont, (USNM). PENNSYLVANIA: Erie Co: West Springfield, male, 5 IX 1977, ECM, (USNM); Forest Co: Pigeon, Marienville Rod & Gun Club, male, 28-29 July 1976, JSW, (JSW). SOUTH CAROLINA: Aiken Co: Savannah River Plant, Tinker Cr, male, 15-16 X 1976, DDH & SP, (CUCC).

Lepidostoma (Mormomyia) serratum Flint & Wiggins
(f. 130, 143)

Lepidostoma serratum Flint and Wiggins 1961:281, 292, f. 7A-C, 17 (male, female); Wray 1967:56; Wallace and Sherberger 1972:227; Etnier and Schuster 1979:19-20; Unzicker et al. 1982:9.106, 9.107.

Male. Scape simple, 0.5 mm long. Maxillary palp simple linear, 0.5 mm long. Wings similar to *L. (M.) vernale*. Anterior wing 8.0 mm long. Genitalia (f. 130) having segment X in dorsal view with blunt mesal process; ventrolateral processes about twice as long as mesal processes, slightly curved mesad and acuminate. Parameres long, slender, asymmetrical and not fused mesially or basally (a series of males collected at Louisiana, Schoolhouse Spring, exhibit an interesting variation, sometimes having one, both, or neither parameres bifid apically). Inferior appendage with short, broad basodorsal process.

Female. Genitalia (f. 143) segment IX in lateral view with deep posterior groove. Spermathecal sclerite similar to that of *L. (M.) griseum*, but in lateral view without dorsal lobe.

Immatures, case and habitat. Final instar larva builds panel case, usually cigar-shaped, but sometimes square in cross-section, consisting of hexagonal pieces of leaf or bark. Several immatures collected at Louisiana, Schoolhouse Spring (water temperature 19°C), indicating that this species may be endemic to spring habitats.

Life history. Larvae collected 30 March to 24 August, pupae 30 March to 2 September. Recorded flight dates: 30 March - 20 September.

Distribution. Louisiana, Connecticut, and North Carolina.

Type data. Flint and Wiggins (1961): "*Holotype*, male and *allotype*, female: Crabtree Meadows Camp Ground, Blue Ridge Parkway, North Carolina, IX-16-58 (Flint and Wiggins). *Paratypes*: Same locality, but IX-3-59, 1 female; IX-2-59, 1 male pupa (Flint and Wiggins)." See type material examined below.

Material examined. Holotype male and allotype female, (USNM). CONNECTICUT: Windham Co: Putnam, male, 1-20 IX 1965, AB Klots, (USNM). LOUISIANA: Ouachita Co: 6 mi. SW of Calhoun, Jackson Parish, Schoolhouse Spring, male, 2 females, 2 male pupae, 7 pupae, 40 larvae, 30 III 1973, HHR et al., (CUCC, male INHS); 2 males, 3 females, 23 IV 1982, RWH & SWH, (CUCC); male, 11 females, 25 larvae, 28 IV 1973, JCM & CED, Louton, (CUCC); 50 larvae, pupa, 30 VI 1958, INHS; male, larva, 19 V 1959, HHR & Stannard, (CUCC); 25 larvae, 3 VI 1973, JCM & Louton, (CUCC); 3 prepupae, 24 VIII 1973, JCM & Louton, (CUCC). NORTH CAROLINA: Swain Co: Great Smoky Mts Natl Pk, Mingus Cr, 2 males, 20 females, 9-10 IX 1983, JSW, (JSW).

Lepidostoma (Mormomyia) etnieri Weaver n. sp.
(f. 131)

This species is closely related to *L. (M.) carrolli* by having similar parameres, but its male is distinguishable by having a unique C-shaped segment X in lateral view.

Male. Scape and maxillary palp similar to those of *L. (M.) vernale.* Wings extraordinarily broad. Anterior wing about 8.0 mm long and 3.0 mm broad. (In type, apices of both fore wings torn and missing.) Posterior wing 3.0 mm broad and truncate. Genitalia (f. 131) having tergum IX with pair of small round setose warts. Segment X with short dorsomesal process in dorsal view and with large curved hook and smaller ventral process pointed ventrad, forming C-shaped process in lateral view. Phallus asymmetrical. Parameres with right paramere spade-shaped and twice as large as left one. Inferior appendage with basodorsal and middorsal processes subequal in length, first article with one or two apicolateral points curved mesad and with basodorsal bulbous hump in dorsal view.

Female, immature, case and habitat. Unknown.

Life history. Recorded flight date: 30 April.

Type material. *Holotype*: TENNESSEE: Knox Co: Knoxville, stream at Paper Mill Rd. and Weisgarber Ave., male, 30 IV 1966, DAE, (USNM).

Etymology This species is named in honor of its collector David A. Etnier.

Lepidostoma (Mormomyia) Libum Group

This group comprises three species, *L. (M.) excavatum, libum,* and *sommermanae*.

Male. Maxillary palp slender, fingerlike and linear. Wing venation similar to that of *L. (M.) vernale.* Genitalia (f. 132-134) having tergum IX with medium-sized setose warts. Segment X with pair of fingerlike setose lateral processes. Phallus with left basal side of phalicata enlarged in dorsal view. Parameres with basal halves fused. Inferior appendage having first article with dorsal subapical emargination in lateral view, second article apparently in dorsal subapical position.

Female. Genitalia (f. 144-146) having spermathecal sclerite similar to that of *L. (M.) mitchelli*.

Immatures, case and habitat. Larvae of *L. (M.) libum, excavatum* and *sommermanae* have been identified. Both early and late instars of these species usually construct stone cases only (f. 2), they also appear to be endemic to small springs.

Distribution. Wisconsin to Quebec to North Carolina.

Lepidostoma (Mormomyia) excavatum Flint & Wiggins
(f. 132, 144)

Lepidostoma excavatum Flint and Wiggins 1961:281, 289-290, f. 6, 22 (male, female); Wray 1967:56; Wallace and Sherberger 1972:227; Etnier and Schuster 1979:19; Parker and Voshell 1981:6; Unzicker et al. 1982:9.106, 9.107.

Male. Scape, maxillary palp and wing venation similar to that of *L. (M.) vernale*. Anterior wing about 8.0 mm long. Genitalia (f. 132) similar to those of *L. (M.) sommermanae*, but inferior appendage with second article acuminate and longer than middorsal process.

Female. Genitalia (f. 144) having spermathecal sclerite almost rectangular in lateral view. Ventral sclerite of oviduct crenate apically, with about three small lobes.

Immatures, case and habitat. Like other species of the *L. (M.) libum* group, larva of this species are endemic to small mountain springs and construct cylindrical cases of small stones only (f. 2). Case of final instar with anterior width 2.0-2.2 mm, posterior width 1.5-1.8 mm, and length 9.5-10.0 mm.

Life history. Larvae collected 30 May to 15 August, pupae 8 June to 15 August. Recorded flight dates: 13 August - 13 September.

Distribution. North Carolina and Tennessee.

Type data. Flint and Wiggins (1961): "*Holotype*, male and *allotype*, female: Indian Gap, about 5,000 ft., Great Smoky Mountains National Park, Tennessee, IX-13-58 (Flint and Wiggins). *Paratypes*: Same data, 2 males, 3 females." Paratype male at the INHS (J. D. Unzicker). See type material examined below.

Material examined. Holotype male, allotype female, (USNM). NORTH CAROLINA: Macon Co: Wayah Crest Cpg, 10 larvae, 30 V 1981, JSW & RWH, (JSW); Wayah Bald, male pupa, 10 larvae, 8 VI 1961, OSF, (USNM); ibid, Rattlesnake Spring, prepupa, 2 pupae?, 26 V 1981; 12 males, 4 females, 22-23 VII 1983, JSE, (JSW); Swain Co: Great Smoky Mts Natl Pk, Moore Spring, 4650', male, male pupa, 10 larvae, 14-15 VIII 1982, JSW & PJS, (JSW); ibid, spring at Luftee Gap, 5000', 3 males, 8-9 IX 1983, JSW, (JSW). TENNESSEE: Blount Co: Great Smoky Mts Natl Pk, Gregory Bald, small spring near Sheep-pen Gap, Cpg 13, 13 males, 4 females, 13-14 VIII 1982, JSW & PJS, (JSW).

Lepidostoma (Mormomyia) libum Ross
(f. 2, 133, 145)

Lepidostoma liba Ross 1941:120-121, pl. 13 f. 97-97D (male, female); Flint and Wiggins 1961:280, 281, 284-286, f. 1A-B, 8 (male, female); Weidner 1964:83; Edwards 1967:126; Fischer 1970:59; Wallace and Sherberger 1972:226; Solomon and Leiser 1977:166; Webb 1980:97; Steven and Hilsenhoff 1984:165.

Male. Scape, maxillary palp and wing venation similar to those of *L. (M.) vernale*. Genitalia (f. 133) similar to those of *L. (M.) sommermanae*, but inferior appendage with longer basodorsal process, about half as long as first article.

Female. Genitalia (f. 145) with spermathecal sclerite similar to that of *L. (M.) griseum*, but without dorsal lobe in lateral view.

Immatures, case and habitat. Larvae inhabit small springs. Ross (1944) reported that larvae of this species construct both stone and panel cases. I have observed specimens which substantiate this, but there seems to be a much lower frequency of larvae with panel cases. In a series of 42 pupae, I observed only 2 specimens with panel cases and all others with stone cases (f. 2). Hence, the typical larval behavioral development to convert to panel type construction apparently is suppressed strongly and is not obligatory in *L. (M.) libum*. Stone case of final instar with anterior width 1.3-1.6 mm, posterior width 2.0 mm and length 8.2-8.5 mm.

Life history. Larvae collected year-round, pupae 16 April to 15 September. Recorded flight dates: 12 May - 15 September.

Distribution. Illinois and Wisconsin. Edwards' (1967) record of *L. (M.) libum* from Tennessee is doubtful and is more probably *L. (M.) excavatum*. Justly, Etnier and Schuster (1979) did not include *L. (M.) libum* in their species list of Tennessee caddisflies.

Type data. Ross (1941): "*Holotype*. - male, stream in Botanical Garden, Elgin, Illinois; June 6, 1939 (Burks & Riegel). *Allotype*. - female, same data as for holotype [INHS]. *Paratypes*. - 1 female, same data as for holotype, but June 13, 1939 (Frison & Ross); 1 female, same data as for allotype; 3 males, 37 females, Quincy, Cave Springs, Illinois, September 15, 1939 (Ross & Riegel); 1 female, spring at McCann school, LaRue, Illinois, May 12, 1939 (Burks & Riegel).

Paratypes are in the collections of the Illinois Natural History Survey and The Academy of Natural Sciences of Philadelphia." Holotype at the INHS (Webb 1980). One paratype in the Zoologisches Museums Hamburg (Weidner 1964). I have seen one female paratype at the MCZC, "M.C.Z. Paratype 26848." See type material examined below.

Material examined. Holotype male, allotype female, (INHS). **ILLINOIS:** Aesculus Glen, Wolf Lake, 6 larvae, 30 IV 1953, L Stannard, HHR, (INHS); Elgin, Botanical Gardens, larva, 9 V 1939, HHR & Burks, (INHS); Adams Co: Quincy, Cave Spring, 36 pupae, 4 male pupae, 15 IX 1939, HHR & Mohr, (INHS); La Salle Co: 4 mi W of Utica at Split Rock, 10 larvae, 7 III 1961, HHR & CPA, (INHS). **WISCONSIN:** Sauk Co: Otter Cr, 16 larvae, 2 IV 1980; 2 male pupae, 16 IV 1980; 2 males, 2 females, 4 VI 1980, JC Steven, (JSW).

Lepidostoma (Mormomyia) sommermanae Ross
(f. 134, 146)

Lepidostoma sommermanae Ross 1946:267, 268, 270, 286-287, f. 18A, 34A-B (male, female); Flint and Wiggins 1961:281, 282, 288-289; f. 5A-C, 21 (male, female); McConnochie and Likens 1969:150; Fischer 1970:64; Wallace and Sherberger 1972:227; Roy and Harper 1979:163; Masteller and Flint 1979:169, 174; Neves 1979:171; Webb 1980:98; Swegman et al. 1981:131, 144; Huryn and Foote 1983:792; Waltz and McCafferty 1983b:16; Lake 1984:221.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Genitalia (f. 134) with inferior appendage similar to that of *L. (M.) libum*, but basodorsal process shorter, stout and about 0.25 times as long as first article.

Female. Genitalia (f. 146) similar to those of *L. (M.) mitchelli*, but spermathecal sclerite with height and length subequal in lateral view and ventral sclerite of oviduct crenate apically in ventral view.

Immatures, case and habitat. Ross (1946) and Flint and Wiggins (1961) reported that the larvae of *L. (M.) sommermanae* construct cases of small stones and were found in springs; my observations agree with theirs. Final instar case anterior width 1.9-2.0 mm, posterior width 1.5 mm, and length 8.5-9.0 mm.

Life history. Larvae collected 27 March to 19 June, pupae 26 May to 28 August. Recorded flight dates: 15 May - 28 October.

Distribution. Connecticut, Delaware, Indiana, Massachusetts, New Hampshire, New York, Ohio, Pennsylvania, Quebec, and Virginia.

Type data. Ross (1946): "*Holotype*. - male, Mt. Carmel, Connecticut, Woodruff's Pond, May 15, 1944, Mrs. A. H. Sommerman. *Allotype*. - female, Mt. Carmel, Connecticut, September 4, 1944, Mrs. A. H. Sommerman. *Paratypes*. - Connecticut, Mt. Carmel, Spruce Bank Spring, June 26, 1944, Mrs. A. H. Sommerman, 1 male; Sept. 4, 1944, 1 female. Pennsylvania - Roxboro, June 28, 1 male; Aug. 15, 1909, Haimbach, 1 male (ANSP)." Holotype at the INHS (Webb 1980). Allotype and paratypes at the INHS (pers. comm. J. C. Unzicker).

Material examined. INDIANA: Tippecanoe Co: West Lafayette, 2 males, 24 IX 1978; male, 2 X 1978; male, female, 5 X 1979; male, female, 28 V 1979, (PURC); Wayne Co: Richmond, Hayes R., male, 23 VIII 1980, (PURC). **NEW YORK:** Tompkins Co: Dryden, Ellis Hollow, male, female, 6 IX 1956, OSF, (USNM). **OHIO:** Wayne Co: Wooster, male, 8 VI 1959, CA Triplehorn, (USNM). **PENNSYLVANIA:** Chester Co: Atglen, Glen Run, 2 males, 17-18 V 1977; male, 31 VII 1976; male, 2-3 VI 1977, JSW, (JSW); Elk Co: Ridgway, spring near Clarion River, 2 males, 29-30 V 1977, JSW, (JSW); Erie Co: Behrend College, 5 males, 23 VI-12 VII 1976; male, 18 VII 1978; ECM, (USNM); Fulton Co: Crystal Spring, Chestnut Bridge Hollow 3 male pupae, 15 larvae, 29 VI 1976; male, female, 23-24 VII 1976; male pupa, female pupa, 15 larvae, 29 VI 1977; 19 males, 37 females, 31 VII 1976, JSW, (JSW); Sommerset Co: Laurel Hill St Pk, female, male pupa, 26 V 1974, RFS, (USNM); Tioga Co: Ansonia, Colton Point, Right Branch Run, male, 30 VI 1978, JSW, (JSW); Washington Co: Amity, spring near Ten Mile Run, 2 males, 2 females, 15 VIII 1976, B Owen, (JSW); Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, male, 10-11 IX 1975, JSW & JLS, (JSW).

Lepidostoma (Mormomyia) Vernale Group

This group comprises four species, *L. (M.) flinti*, *glenni*, *sackeni*, and *vernale*.

Male. Maxillary palps (f. 124) slender, fingerlike, linear, held anterior of frons and apparently one-segmented. Wings with venation like that of *L. (M.) vernale* (f. 126). Genitalia (f. 135-138) having segment IX with large dorsum and with large setose warts comprising most of dorsum (the highly specialized and enlarged ovoid dorsum of *L. [M.] sackeni* may be an extreme modification of this character). Segment X with lateral pair of slender processes sometimes bifid. Phallus symmetrical (except for *L. [M.] sackeni*). Parameres with basal halves fused. Inferior appendages with basal ventromesal margins of first articles broadly fused at least half their lengths in ventral view.

Female. Genitalia (f. 147-149) having spermathecal sclerite of *L. (M.) flinti* and *vernale* pointed posteriorly, but that of *L. (M.) sackeni* more similar to that of *L. (M.) griseum*.

Immatures, case and habitat. Observation of pupal specimens of *L. (M.) flinti* and *vernale* suggests that final larval instars of this group construct panel cases.

Distribution. Eastern North America including Georgia to Newfoundland to Wisconsin.

Lepidostoma (Mormomyia) flinti Wallace & Sherberger
(f. 135, 147)

Lepidostoma flinti Wallace and Sherberger 1972:224-225, 227, f. 5-7 (male); Unzicker et al. 1982:9.106, 9.107.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Anterior wing about 8.8 mm long. Genitalia (f. 135) having tergum IX large with setose warts comprising most of dorsum. Segment X with bifid lateral processes. Phallus symmetrical, basal half of parameres fused. Inferior appendages with basodorsal process spiniform and approximately as long as first article.

Female. Genitalia (f. 147) similar to those of *L. (M.) vernale*, having spermathecal sclerite pointed posteriorly in ventral view, but in lateral view somewhat circular with small anterior lobe.

Immatures, case and habitat. Larvae appear to be endemic to mountain springs and late instars build panel cases which are square in cross-section, composed of hexagonal pieces of leaf and bark.

Life history. Larvae and pupae collected 11 May to 15 August. Recorded flight dates: 3 April - 7 June.

Distribution. Appalachian Mountains of North Carolina and South Carolina.

Type data. Wallace & Sherberger (1972): "*Holotype*, male, Highlands, Macon Co., North Carolina, 3 April 1961, by O. S. Flint, Jr. (in U.S. National Museum, type no. 71978). *Paratypes*: - 1 male, Smokemont Camp Ground, Great Smoky Mt. Nat. Pk., North Carolina, 11 May, 1970, by O. S. Flint, Jr. (U. S. National Museum); 1 male, 4.0 mi. south of summit of Mt. Pisgah, Transylvania Co., North Carolina, 7 June, 1971, by J. B. Wallace, et al." Male paratype in the INHS (pers. comm. J. D. Unzicker). See type material examined below.

Material examined. **NORTH CAROLINA**: Macon Co: Wayah Bald, Rattlesnake Spring, 4 males, 3 females, 30-31 V 1981, JSW & RWH, (JSW); ibid, Wayah Crest Cpg, male, 30-31 V 1981, JSW & RWH, (CUCC); Swain Co: Great Smoky Mts Natl Pk, Moore Spring, male pupa, 8 larvae, JSW & PJS, (JSW); Great Smoky Mts Natl Pk, Smokemont Cpg, male paratype, male pupa, 5 pupae, 11-14 V 1970, OSF, (USNM). **SOUTH CAROLINA**: Oconee Co: Crane Cr, 5 mi NW of Tamassee, male, 26-27 V 1980, JSW & TRW, (JSW).

Lepidostoma (Mormomyia) glenni Wallace & Sherberger
(f. 136)

Lepidostoma glenni Wallace and Sherberger 1972:225-226, 227, f. 8-9 (male); Unzicker et al. 1982:9.107.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Genitalia (f. 136) similar to those of *L. (M.) flinti*, but distinguished by having inferior appendage with basodorsal process much shorter than first article, slightly shorter than middorsal process.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 30 May - 2 June.

Distribution. Only known from Union County, Georgia.

Type data. Wallace & Sherberger (1972): "*Holotype*. - male, extreme southwestern Union Co., Georgia, 2 June 1971, taken by a small spring-fed stream at 2000' by F. F. Sherberger et al." See type material examined below.

Material examined. Holotype male, (INHS). **GEORGIA**: Union Co: Vogel St Pk, Wolf Cr, male, 30-31 V 1980, JCM, (CUCC).

Lepidostoma (Mormomyia) sackeni (Banks)
(f. 137, 148)

Mormomyia sackeni Banks 1936:267-268, f. 9, (male).

Lepidostoma sackeni Flint and Wiggins 1961:280, 281, 282-284, 10A-B, 14A-B (male, female); Ellis 1962:5, 14; Blickle and Morse 1966:11; McConnochie and Likens 1969:150; Fischer 1970:64; Wallace and Sherberger 1972:226; Hilsenhoff et al. 1972:22, 28; Longridge and Hilsenhoff 1973:180; Roy and Harper 1975:1085; Hilsenhoff 1975:25; Roy and Harper 1979:163; Tarter and Hill 1979:206; Masteller and Flint 1979:169, 174; Neves 1979:171; Hilsenhoff 1981:31; Swegman et al. 1981:131, 144; Marshall and Larson 1982:78; Huryn and Foote 1983:792; Steven and Hilsenhoff 1984:166.

Male. Scape, maxillary palp and wings similar to *L. (M.) vernale*. Anterior wing 7-8 mm long. Genitalia (f. 137) having tergum IX large, setose, egg-shaped, extending posteriorly beyond other genital appendages. Phallus slightly asymmetrical, with basal half of parameres fused. Inferior appendages short, in ventral view about twice as wide as long.

Female. Genitalia (f. 148) with spermathecal sclerite similar to that of *L. (M.) griseum*, but posterior margin of sternite VIII with long bilobed mesal process (Flint and Wiggins 1961: f. 14A).

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 22 July - 17 September.

Distribution. Maine, Massachusetts, Michigan, Newfoundland, New Hampshire, New York, Nova Scotia, Ohio, Ontario, Pennsylvania, Quebec, West Virginia, and Wisconsin.

Type data. Banks (1936): "From Dubois, Pa., 5 Sept. (Melander), North Conway, N.H., 16 Aug. (Osten Sacken) and Trenton Falls, N.Y. (Osten Sacken). Types in Deutsches Entomologisches Institut, Berlin-Dahlem, and

Museum of Comparative Zoology, Cambridge, Mass." Male paratype in the INHS (pers. comm. J. D. Unzicker).

Mormomyia sackeni Banks, *New Lectotype*. - male, North Conway, N.H., VIII 16, O. Sacken, "M.C.Z. Type 22667" MCZC. Also, one male paratype at the MCZC, Trenton Falls, N.J., 1860, O. Sacken, "M.C.Z. Paratype 22667" MCZC.

Material examined. **MAINE:** Aroostook Co: Oxbow, male, 22-23 VII 1961, A Brower, (USNM). **MICHIGAN:** Presque Isle Co: Ocqueoc Lake, male, female, 27-31 VII 1974, RW & ER Hodges, (USNM). **NOVA SCOTIA:** Lunenburg Co: Green Bay, male, female, 5 IX 1956, DC Ferguson, (USNM). **PENNSYLVANIA:** Forest Co: Pigeon, Marienville Rod & Gun Club, Hatchery Spring, 13 males, 28-29 VII 1976, JSW, (JSW); Sommerset Co: Laurel Hill St Pk, Jones Mill Run, male, 20-21 VIII 1976, JLS & JSW, (JSW); Westmoreland Co: Linn Run St Pk, Linn Run, male, 25-26 IX 1976, JSW, (JSW); Laughington, Laurel Summit Rd, Spruce Run, 20-21 VIII 1976, JSW, (JSW); Rector, Powdermill Nature Reserve, Maul Spring, male, female, 10-11 IX 1975, JSW & JLS, (JSW).

Lepidostoma (Mormomyia) vernale (Banks)
(f. 124, 126, 138, 149)

Mormonia vernalis Banks 1897:29 (male, female).

Lepidostoma vernalis: Flint and Wiggins 1961:181-182, f. 4A-B, 20 (male, female); Wiggins 1961:702; Wallace and Sherberger 1972:227; Etnier and Schuster 1979:20; Masteller and Flint 1979:169; Neves 1979:171; LaFontaine 1981:251; Marshall and Larson 1982:78, f. 152; Huryn and Foote 1983:792; Steven and Hilsenhoff 1984:166.

Lepidostoma vernale: Fischer 1970:68; Roy and Harper 1975:1085; Roy and Harper 1979:163; Swegman et al. 1981:131, 144.

Male. Head (f. 124) with scape cylindrical, 0.5 mm long. Maxillary palp apparently one-segmented, fingerlike, slender, held anteriorly. Wings (f. 126) brown. Anterior wing 8-9 mm long. Genitalia (f. 138) having segment IX large with large dorsal setose warts covering most of tergum. Segment X in dorsal view, with long pair of curved spiniform processes, originating close together mesially and diverging laterally, and with lateral pair of much shorter processes. Phallus symmetrical. Parameres with basal halves fused. Inferior appendage with basodorsal process bifurcate or trifurcate and shorter than middorsal process.

Female. Wings (f. 126). Genitalia (f. 149) similar to those of *L. (M.) flinti* by having spermathecal sclerite pointing posteriorly, but not angled as acutely.

Immatures, case and habitat. Several pupae with panel cases similar to those of *L. (M.) flinti* were collected from springs.

Life history. Pupae collected in June. Recorded flight dates: 28 March - 30 July.

Distribution. Connecticut, Maine, Maryland, Massachusetts, Michigan, Newfoundland, New Hampshire, New York, Nova Scotia, Ohio, Ontario, Pennsylvania, Quebec, Virginia, West Virginia, and Wisconsin. Previous records from North Carolina originally reported by Banks (1914) and subsequently referred to by Ross (1946) and Etnier and Schuster (1979) are based on specimens confirmed to be *L. (M.) flinti* (Flint and Wiggins 1961, Wallace and Sherberger 1972).

Type data. Banks (1897): "Sea Cliff, N.Y.; common near streams, March, April and May." Ross (1938b): *Lectotype*, male - Sea Cliff, Long Island, N.Y., March 28, No. 11687. *Lectoallotype*, female. Same data." I have seen these two lectotypes and three other syntypes at the MCZC. Male syntype at the INHS (pers. comm. J. D. Unzicker).

Material examined. **CONNECTICUT:** Sleeping Giant Pk, tributary of Mill Cr, male pupa, male, 2 females, 15 V 1962, SW Hitchock, (USNM). **MARYLAND:** Prince Georges Co: Oxon Hill, male, 11 V 1972, (USNM). **MICHIGAN:** Emmet

Co: Pellston, spring at base of Maple River Dam, male pupa, 12-13 VI 1972, preserved 30 VI, DW Barr & IM Smith, (ROME). NEW HAMPSHIRE: Coos Co: Jefferson Notch Road, Seboisis Brook, male, 7-8 VII 1977, JSW, (JSW); Pickham's Notch, Cutler River, male, 8-9 VII 1977, JSW, (JSW). PENNSYLVANIA: Chester Co: Atglen, Glen Run, 25 males, female, 24 IV 1977; male, 11 IV 1977; 4 males, 2-3 VI 1977, JSW, (JSW); Elk Co: S Branch Island Run, 2 mi. S of Ridgway, male, 29-30 V 1977, JSW, (JSW); Forest Co: Pigeon, Marienville Rod & Gun Club, male, 28-29 VII 1976, JSW, (JSW); Fulton Co: Crystal Springs, Chestnut Bridge Hollow, 3 males, female, 29 V 1977, JSW, (JSW); Lancaster Co: Welsh Mts, New Holland Watershed Area, male, 23 VII 1978, JSW, (JSW); Westmoreland Co: Rector, Powdermill Nature Reserve, Maul Spring, 16 males, 7 females, 20-21 V 1977; male, 31 V 1975, JSW, (JSW). VIRGINIA: Shenandoah Natl Pk, White Oak Canyon, male, 8 V 1965, OSF, (USNM); Rappahannock Co: Shenandoah Natl Pk, Range View Cabin, 13 males, 5 females, 23-24 V 1980, OSF, (USNM). WEST VIRGINIA: Jefferson Co: Harpers Ferry, male, 1 IV 1979, RFS, (JSW).

Lepidostoma (Mormomyia) Mitchelli Group

This group comprises three species, *L. (M.) lobatum*, *mitchelli*, and *styliferum*.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Genitalia (f. 139-141) generally similar to those of *L. (M.) vernale*; but abdominal segment IX smaller in length with dorsal setose warts smaller, not occupying majority of dorsum. Segment X with lateral pair of bifid arms. Phallus symmetrical in *L. (M.) mitchelli*, but not in *L. (M.) lobatum* and *styliferum*. Parameres similar to those of *L. (M.) vernale* group, with basal halves fused. Inferior appendage also similar to that of *L. (M.) vernale* group, but with additional small dorsomesal hook.

Female. Genitalia (f. 150) with spermathecal sclerite not pointed posteriorly as in *L. (M.) vernale* and *flinti*, and more similar to that of *L. (M.) libum* group.

Immatures, case and habitat. Final instar larvae construct panel cases.

Distribution. Southern Appalachian Mountains of Georgia, North Carolina, South Carolina, and Tennessee.

Lepidostoma (Mormomyia) lobatum Wallace & Sherberger
(f. 139)

Lepidostoma lobatum Wallace and Sherberger 1972:222-224, 227, f. 1-3, 3A (male); Unzicker et al. 1982:9.106, 9.107.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Genitalia (f. 139) very similar to those of *L. (M.) styliferum*, having asymmetrical phallus, but with main article of inferior appendage not obscuring middorsal process in lateral view.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 30 May - 23 June.

Distribution. Appalachian Mountains of Georgia.

Type data. Wallace & Sherberger (1972): "*Holotype.* - male, Coweeta Hydrologic Laboratory, Macon Co., North Carolina, 11 June 1970. *Paratype.* - 1 male, extreme southwestern Union Co., Georgia, 23 June 1969. Both specimens collected at light beside small spring-fed streams at 2000-2500 ft. elevation by J. B. Wallace and F. F. Sherberger." See type material examined below.

Material examined. Holotype male, (INHS). GEORGIA: Union Co: Vogel St Pk, Wolf Cr, male, 30-31 V 1980, JCM, (CUCC).

Lepidostoma (Mormomyia) mitchelli Flint & Wiggins
(f. 140, 150)

Lepidostoma mitchelli Flint and Wiggins 1961:281, 286-288, f. 2A-B, 16 (male, female); Wray 1967:56; Wallace and Sherberger 1972:224, 227, f. 4 (male); Etnier and Schuster 1979:19; Parker and Voshell 1981:6; Unzicker et al. 1982:9.106, 9.107.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Anterior wing about 8.0 mm long. Genitalia (f. 140) similar to those of *L. (M.) flinti* and *styliferum*. Segment IX with small pair of dorsal warts. Phallus almost symmetrical, basal halves of parameres fused. Inferior appendages with small pair of dorsomesal hooks.

Female. Genitalia (f. 150) similar to those of *L. (M.) excavatum*; but spermathecal sclerite longer in lateral view, ventral sclerite of oviduct crenate apically in ventral view.

Immatures, case and habitat. Flint and Wiggins (1961) reported that larvae and pupae dwell in small mountain springs and final instars build panel cases like those of *L. (M.) griseum*.

Life history. Larvae and pupae collected in early September. Recorded flight dates: 20 March - 14 August.

Distribution. North Carolina and Tennessee.

Type data. Fline & Wiggins (1961): "*Holotype*. - male and *allotype*, female, Camp Alice, 5796 ft., Mt. Mitchell, North Carolina, IX-16-58 (Flint & Wiggins). *Paratypes*. - Same locality but 1 female pupa collected IX-1-59, emerged IX-2-59; 1 male, 2 females, pupae collected IX-3-59, emerged IX-7-59, 1 pupa preserved (Flint & Wiggins). Stream crossing Route 128, Mt. Mitchell, North Carolina, 1 male pupa collected IX-1-59, emerged IX-59 (Flint & Wiggins). Highlands Biological Station, Highlands, North Carolina, 1 female, IX-14-58 (Flint & Wiggins)." "This species is known from North Carolina, with two localities at elevations of 4000 ft. or more." Male paratype at the INHS (pers. comm. J. D. Unzicker). See type material examined below.

Material examined. Holotype male, allotype female, (USNM); paratype female, (INHS). **NORTH CAROLINA**: Yancey Co: Black Mts, 4760', Hemphill Spring, male, 1-2 VII 1979; male, 2-3 IX 1978, JSW, (JSW).

Lepidostoma (Mormomyia) styliferum Flint & Wiggins
(f. 141)

Lepidostoma stylifer Flint and Wiggins 1961:281, 286, f. 3A-C (male); Wray 1967:56; Wallace and Sherberger 1972:227; Etnier and Schuster 1979:20; Unzicker et al. 1982:9.106, 9.107.

This species is very close to *L. (M.) lobatum*, and in fact these species may be synonymous.

Male. Scape, maxillary palp and wings similar to those of *L. (M.) vernale*. Genitalia (f. 141) very similar to those of *L. (M.) lobatum* by having phallus asymmetrical and parameres short, about a third as long as phalicata, but distinguishable by having more slender inferior appendage in lateral view with middorsal process not greatly obscured by the main article.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 2 June - 1 July.

Distribution. South Carolina and Indian Gap, Tennessee (near the North Carolina state line).

Type data. Flint & Wiggins (1961): "*Holotype*. - male, Indian Gap, about 5000 ft., Great Smoky Mountains National Park, North Carolina, VII-1-58 (Flint & J. F. Hanson)." See type material examined below.

Material examined. Holotype male, (USNM). **SOUTH CAROLINA:** Oconee Co, spring above Wash Branch, 5 mi NW of Tamassee, male, 2-3 VI 1980, JSW & EMM, (JSW).

Lepidostoma Subgenus *Neodinarthrum* Weaver n. subgen.

Type species: *Olemira pluvialis* Milne.

Etymology: Greek, *Neos*, new; *deinos*, terrible; *arthron*, joint.

This subgenus comprises the *L. (Neo.) canthum* (two spp.) and the *L. (Neo.) pluviale* groups (six spp.). Species of this subgenus share with members of the Eurasian genus *Dinarthrum* the unfortunate characteristic of being difficult to distinguish from each other due to considerable variation of the male genitalia, especially in segment X.

Male. Head and its appendages generally resemble those of *L. (Neo.) pluviale* (f. 151). Scape longer than head. Maxillary palps distinctly two-segmented, length subequal to scape, each segment cylindrical, apical segment with many stout apical setae. Wings (f. 152, 153) more narrow than in other subgenera of *Lepidostoma*, having anterior wing with broad or narrow anterior costal cell, bearing many dark scalelike setae; venation with *Cu*1 unbranched, *Cu*2 and 1*A* interrupted by small fold adjacent to 2*A* just basad of arculus, 3*A* about 2/3 as long as 2*A* and terminating in hind margin. Hindwing with *Cu*1 unbranched, 1*A* and 2*A* apparently fused and only *F*1 present. Genitalia (f. 154-162) with tergum IX broad in lateral view. Segment X with dorsomesal lobe bearing lateral processes (possibly intermediate appendages), being prominent and horn-shaped in *L. (Neo.) canthum* group, but each reduced to a pair of lateral bifarious points in *L. (Neo.) pluviale* group. Phallus with phallic apodeme short, phallic shield spoon-shaped with posterior "handle" articulating with basal plate of inferior appendages; parameres spiniform, slender, slightly shorter than phalicata; phalicata curved near its base; phallotremal sclerite small. Inferior appendages with first article long, narrow; second article small, acuminate, subapical process directed posteriorly in *L. (Neo.) pluviale* group, but in *L. (Neo.) canthum* group reduced; basodorsal process slender, directed dorsoposteriorly; ventromesal ridge broad, narrow or reduced; without horizontal middorsal process as in *L. (Nosopus)* and *L. (Mormomyia)* species.

Female. Head with scape slightly longer than in male. Wings (f. 152, 153) typical of genus, hindwing with 1*A* and 2*A* apparently fused. Genitalia (f. 163-168) having segment VIII with chalice-shaped sclerotized pattern on sternum (f. 167) indicating position of concave egg pouch and retained spherical eggmass. Spermathecal sclerite usually pentagonal in ventral view, but sometimes triangular or U-shaped.

Immatures, case and habitat. Immatures have been identified for four species of the subgenus. Found in mountain and coastal streams. Final instar larva constructs very smooth, slightly curved case composed of small sand grains, posterior width less than 1.0 mm (f. 1).

Distribution. This subgenus is endemic to the Pacific Coastal and Rocky Mountain regions, being known from Baja California and New Mexico to British Columbia and South Dakota.

Key to Adults of *L. (Neodinarthrum)* Species (males)

1a. Segment X with long, hornlike, heavily sclerotized lateral process (f. 154, 155), anterior wing with narrow costal cell (f. 153); *canthum* group 2
1b. Segment X with lateral process reduced to bifarious hooks (f. 156-162), anterior wing with broad costal cell (f. 152); *pluviale* group 3

2a. Lateral processes of segment X each with apex strongly curved dorsad in lateral view, not concealed by dorsomesal processes of segment X in dorsal view; apicomesal processes of segment X with wide V-shaped notch (f. 155); California .... *baxea* Denning, p. 77.
2b. Lateral processes of segment X each with apex only slightly curved dorsad in lateral view, mostly concealed by dorsomesal processes of segment X in dorsal view; apicomesal processes of segment X with narrow V-shaped notch (f. 154); California .... *canthum* Ross, p. 77.

3a. Segment X with apicomesal lobe extending posteriorly beyond lateral bifarious hooks (f. 158, 160) 4
3b. Segment X with apicomesal process not extended beyond lateral hooks (f. 156, 157, 159, 162) 5

4a. Segment X with apicomesal process pointed; lateral hooks with broad bases; inferior appendage with broad ventromesal ridge (f. 158); California .... *lotor* Ross, p. 80.
4b. Segment X with apicomesal process curved; lateral hooks narrow basally; inferior appendage with smaller ventromesal ridge (f. 160); Baja California Norte to British Columbia and South Dakota ..... *pluviale* (Milne), p. 81.

5a. Segment X with widely separated bifarious lateral hooks, usually with some adjacent mesal tubercles (f. 156, 157, 162) 6
5b. Segment X with appressed bifarious lateral hooks, without mesal tubercles (f. 159); Arizona to Utah .... *ormeum* Ross, p. 80.

6a. Segment X with large dorsolateral hook, extended dorsally as far as top of tergum IX (f. 157); California .... *errigenum* Denning, p. 79.
6b. Segment X with small dorsolateral hook, not extended dorsally as far as tergum IX (f. 156, 162) 7

7a. Ventromesal ridge of inferior appendage broad and squarely angled (f. 162); California to British Columbia .... *rayneri* Ross, p. 83.
7b. Ventromesal ridge of inferior appendage reduced, not strongly angled (f. 156); Utah to Montana .... *apornum* Denning, p. 79.

Lepidostoma (Neodinarthrum) Canthum Group

Closely related to the *L. (N.) pluviale* group, this group comprises only two species, *L. (Neo.) baxea* and *canthum*.

Male. Head and its appendages similar to those of *L. (Neo.) pluviale*. Wings brown, having anterior wing (f. 153) similar to that of *L. (Neo.) pluviale* group, but with narrow costal cell and crossvein *sc-r*; hindwing similar to that of *L. (Neo.) pluviale*. Genitalia (f. 154, 155) with segment IX short and straight and with broad dorsum in lateral view. Segment X with dorsal process long, extending beyond lateral processes; lateral processes prominent, each shaped like cow's horn in lateral view. Phallus shorter than in *L. (Neo.) pluviale* group, but endothecal membrane not reduced as much; parameres straight, about half as long as inferior appendages in lateral view; phalicata curved at its base. Inferior appendages with first article long, narrow; second article and ventromesal ridge reduced (one of which probably represented by small subapical point).

Female. Head and its appendages similar to those of *L. (Neo.) pluviale*. Wings brown, having anterior wing (f. 153) with crossvein *sc-r* present, hindwing like that of *L. (Neo.) pluviale*. Genitalia (f. 163, 164) with spermathecal sclerite triangular or U-shaped in ventral view and with two long narrow dorsal lobes in lateral view.

Immatures, case and habitat. The larvae of *L. (Neo.) canthum* are similar to those of *L. (Neo.) pluviale*, constructing cases of fine sand grains (f. 1) and inhabiting coastal streams.

Distribution. California.

Lepidostoma (Neodinarthrum) baxea Denning
(f. 155, 163)

Lepidostoma baxea Denning 1958:97-98, f. 6A-B (male); Fischer 1970:39.

Similar to *L. (Neo.) canthum*, but this species is distinguished in having lateral processes of segment X with upturned apices in lateral view. Apparently the epithet *baxea* is a noun in apposition derived from Greek meaning "a woven shoe worn on the comic stage or by philosophers."

Male. Head and its appendages similar to those of *L. (Neo.) pluviale*. Wings brown, anterior wing 7.3-8 mm long with venation and form like *L. (Neo.) canthum*. Genitalia (f. 155) with segment X having lateral processes, each shaped like cow's horn with its apex pointing dorsad in lateral view. Phallus and inferior appendages similar to those of *L. (Neo.) canthum* group.

Female. Head like that of *L. (Neo.) pluviale*. Wings brown, venation similar to that of *L. (Neo.) canthum*. Anterior wing 7.5 mm long. Genitalia (f. 163) with spermathecal sclerite triangular in ventral view and with two narrow dorsal lobes in lateral view.

Immatures, case and habitat. Larva unknown. However, Denning (1958) mentioned that immatures may inhabit Dry Creek, a small intermittent stream in Fresno Co: California.

Life history. Recorded flight dates: 1 May - 2 June.

Distribution. California.

Type data. Denning (1958): "*Holotype.* - male, Dry Creek, Fresno Co., California, May 1, 1954, D. I. Abell, deposited in the collections of California Academy of Sciences." See type material examined below.

Material examined. Holotype male, (DGD). CALIFORNIA: El Dorado Co: El Dorado Natl Forest, Bridal Veil Picnic Area, 11 mi. W of Kyburz, 3120', male, female, 2 VI 1979, JK Gelhaus, (CUCC).

Lepidostoma (Neodinarthrum) canthum Ross
(f. 153, 154, 164)

Lepidostoma cantha Ross 1941:118-119, pl. 13 f. 94-94A (male female); Fischer 1970:39; Roy and Harper 1975:1085 [doubtful record]; Webb 1980:97; McElravy and Resh 1987:80, 88.

Similar to *L. (Neo.) baxea*, but with apices of lateral processes of segment X pointed posteriorly in lateral view.

Male. Head and its appendages like those of *L. (Neo.) pluviale*. Wings brown, anterior wing (f. 153) approximately 7.5 mm long. Genitalia (f. 154): Segment X with mesal process lobelike, extending beyond lateral processes; lateral processes acuminate with apices pointed posteriorly. Phallus and inferior appendages similar to those of *L. (Neo.) baxea*.

Female. Head and its appendages similar to those of *L. (Neo.) pluviale*. Anterior wing (f. 153) approximately 7.5 mm long, crossvein *sc-r* present. Genitalia (f. 164) having spermathecal sclerite with long narrow dorsal processes in lateral view, U-shaped in ventral view.

Immatures, case and habitat. Larvae construct slender cases of small stones and inhabit coastal streams.

Life history. Larvae collected 28 April. Recorded flight dates: 9 April - 5 June.

Distribution. California.

Type data. Ross (1941): "*Holotype*. - male, near small, slow stream, Hastings Natural History Reservation, Monterey Co., California, May 24, 1938 (C. D. Michener, at light). *Allotype*. - female, same data as for holotype [INHS]. *Paratypes*. - 16 males, 16 females, same data as for holotype. Paratypes are in the collections of the Illinois Natural History Survey, the California Academy of Sciences, and The Academy of Natural Sciences of Philadelphia." Holotype at the INHS (Webb 1980).

Material examined. **CALIFORNIA**: Los Angeles Co: Santa Monica Mts, West Stunt Range, Stunt Road, 2 males, 29 V 1978, K Dobry, (JSW); San Diego Co: Potreros, 5 males, 7 females, 9 IV 1974, H & MT, (CUCC); Santa Clara Co: Alum Rock Pk, 3 males, 1 VI 1960, SDS, (USNM); 26 males, 1 VI 1960, SDS, (CASC); Sonoma Co: E of Petacoma Hill Blvd, Copeland Creek, 200', larvae collected 28 IV 1981 (adults reared), LES, (LES).

Lepidostoma (Neodinarthrum) Pluviale Group

This is the sister group of the *L. (Neo.) canthum* group, comprising six species. Many of these species vary only in slight detail and are difficult to distinguish, especially in view of the natural variation expressed in the male abdominal segment X, which often has been regarded as an important diagnostic character.

Male. Head and its appendages as in *L. (Neo.) pluviale* (f. 151). Wings (f. 152) brown. Anterior wing with broad anterior costal cell, folding dorsally over wing, crossvein *sc-r* absent. Genitalia (f. 156-162) having segment IX short with posterior margin slightly curved and dorsum broader in lateral view. Segment X dorsomesal process short, usually not extending posteriorly beyond lateral bifarious points, but sometimes extending just beyond them; lateral processes each reduced to pair of bifarious points. Phallus longer than in *L. (Neo.) canthum* group, extending anteriorly beyond anterior margin of segment IX in lateral view, phallic shield spoon-shaped with long posterior extension articulating with basal plate of inferior appendage; endothecal membrane reduced; parameres spiniform, long, curved near their bases and extending just short of phalicata's apex; phalicata semicircular, extending dorsad from its base and then curving posteriorly near slight constriction at its midlength; both parameres and phalicata similar in curvature with their lengths subequal to that of inferior appendages.

Female. Wing venation as in *L. (Neo.) pluviale* (f. 152). Genitalia (f. 165-168) with spermathecal sclerite pentagonal in ventral view.

Immatures, case and habitat. Often found in mountain streams. Larvae have been identified for only a few species of this group. They are easily recognized by the type of case that they construct (f. 1) which is very slender, posterior width less than 1.0 mm, slightly curved, and made of small sand grains.

Distribution. This group occurs throughout regions west of and including the Rocky Mountains.

Lepidostoma (Neodinarthrum) apornum Denning
(f. 156)

Lepidostoma aporna Denning 1949:117-119, f. 10-10B (male, female); Fischer 1970:38; Roemhild 1982:11; Baumann and Unzicker 1981:27.

Male. Head like that of *L. (Neo.) pluviale*. Wings brown, venation and form like those of *L. (Neo.) pluviale*. Genitalia (f. 156) having segment X with apicomesal processes reduced, lateral processes each reduced to pair of bifarious points, one point directed dorsad, another point directed ventroposteriorly and usually two minute points on posterior face in lateral view. Phallus like that of *L. (Neo.) pluviale*, apex bulbous. Inferior appendage with reduced ventromesal ridge.

Female. I have not examined any females of this species; however the female allotype described by Denning (1949) appears to be close to *L. (Neo.) rayneri*.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 26 May - 22 July.

Distribution. Utah and Montana.

Type data. Denning (1949): "*Holotype*. - male, Beaver, Utah, 8000', June 26, 1942 (C. P. Alexander). *Allotype*. - female, same data as for holotype." See type material examined below.

Material examined. Holotype male, (DGD). UTAH: Beaver Co: Birch Cr, 3 males, 4 females, 22 VII 1976, RWB; Tooele Co: Clover Cr, 6 males, 6 females, 16 VI 1954, ARG, (INHS); ibid, male, 18 VI 1971; male, 3 females, 26 VIII 1971, BR Oblad, (USNM); Utah Co: Payson Can, male, 14 VII 1977, RFS, (JSW); Vivian Park, spring, male, 16 VII 1971, BR Oblad, (JSW); Washington Co: spring above North Juniper Cpg, male, 26 V 1976.

Lepidostoma (Neodinarthrum) errigenum Denning
(f. 157, 165)

Lepidostoma errigena Denning 1954:188, f. 1A-B (male); Fischer 1970:42.

Similar to *L. (Neo.) rayneri* and *L. (Neo.) apornum* this species is distinguished by having the lateral bifarious points of segment X with dorsal point much larger than ventral point.

Male. Head and its appendages as in *L. (Neo.) pluviale*. Wings brown, venation like that of *L. (Neo.) pluviale*. Anterior wing approximately 6.3 mm long. Genitalia (f. 157) having segment X with short apicomesal processes not extending beyond lateral bifarious points in lateral view. Lateral processes each reduced to pair of bifarious points, dorsal point very large with its apex extending dorsad about as far as dorsal margin of segment IX, ventral point minute. Phallus like that of *L. (Neo.) pluviale*. Inferior appendage ventromesal ridge broad, not extending very far from base, with its apex slightly angled.

Female. Head and wings like those of *L. (Neo.) pluviale*. Anterior wing approximately 7.1 mm long. Genitalia (f. 165) with spermathecal sclerite slightly broader than long in ventral view, dorsal margin with deep curved emargination in lateral view.

Immatures, case and habitat. Larvae make cases similar to those of *L. (Neo.) pluviale* and inhabit mountain streams.

Life history. Larvae collected 4 May. Recorded flight dates: 21 June - 28 July.

Distribution. Southeastern California.

Type data. Denning (1954): "*Holotype*. - male, Seven Oaks, Santa Ana River, San Bernardino Mts., San Bernardino County, California, July 8, 1950, John Belkin. *Paratypes*, two males, same data as for holotype; two males, Palomar Mt., San Diego County, July 12, 1946, 4700', C. P. Alexander. Holotype and one paratype deposited in the collection of the Academy of Sciences, San Francisco, California." See type material examined below.

Material examined. Holotype male, (DGD). **CALIFORNIA:** San Bernardino Co: Seven Oaks, Santa Ana River, 2 males, 22 VI 1977, RWB, (BYUC); San Gogronio Mt, scenic stop just downhill from Forest Falls turnoff, 4000', larvae, 4 V 1983 (some reared to adults), LES, (LES); Mono Co: E Walker River, male, female, 28 VII 1983, RF Gill, (DGD); Riverside Co: North Fork of San Jacinto River, 6 mi below Pine Cove, 3 males, female, 21 VI 1977, RWB, (BYUC).

Lepidostoma (Neodinarthrum) lotor Ross
(f. 158)

Lepidostoma lotor Ross 1946:268, 275-276, f. 5A-C (male); Fischer 1970:59; Webb 1980:97.

This species is very distinctive, having lateral processes each reduced to a lateral pair of broad triangular bifarious points and segment X dorsomesal process with apex triangular and extending posteriorly beyond the bifarious process in lateral view.

Male. Head and its appendages like those of *L. (Neo.) pluviale*. Wings brown, venation and form like those of *L. (Neo.) pluviale*. Genitalia (f. 158) having segment X with triangular apex extending beyond two lateral triangular points in lateral view. Phallus like that of other species of the *L. (Neo.) pluviale* group. Inferior appendage ventromesal ridge very broad with sharp apical angle extending halfway to apex.

Female, immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 15 May - 1 June.

Distribution. California. Only known from localities listed below.

Type data. Ross (1946): "*Holotype.* - male, Wadell Creek, California, May 15, 1937." The United States Geological Survey, Gazetteer of California does not list "Wadell Creek," but does list "Waddell Creek" at 37°05'33"N, 122°16'32"W, Santa Cruz Co. Holotype at the INHS (Webb 1980). See type material examined below.

Material examined. Holotype male, (INHS). **CALIFORNIA:** Santa Clara Co: Alum Rock Pk, 3 males, 1 VI 1960, SDS, (JSW). I wish to thank S. D. Smith for giving me these specimens.

Lepidostoma (Neodinarthrum) ormeum Ross
(f. 159, 166)

Lepidostoma ormea Ross 1946:268 (*ormae*), 275, f. 6A (male); Fischer 1970:61; Webb 1980:98; Baumann and Unzicker 1981:27; Ruiter and Lavigne 1985:42; Herrmann et al. 1986:435.

Lepidostoma querla Denning 1949:119-120, f. 11-11A (male) NEW SYNONYM; Fischer 1970:63.

Lepidostoma moneka Denning 1968:67, f. 4-4A (male) NEW SYNONYM; Canton and Ward 1981:457. Baumann and Unzicker 1981:27; Herrmann et al. 1986:435.

This species is unique, having two short lateral bifarious points with adjacent bases (ventral point sometimes absent). I have examined types of *L. ormeum, L. monekum,* and *L. querlum* as well as additional specimens collected at the type locality of *L. querlum* which exhibit natural variation in segment X similar to several forms described under these three available species names.

Male. Head and its appendages as in *L. (Neo.) pluviale*. Wings brown, venation and form like those of *L. (Neo.) pluviale*; anterior wing approximately

7.3 mm long. Genitalia (f. 159) having segment X with lateral processes each reduced to pair of short appressed bifarious points, ventral point sometimes reduced. Phallus like that of *L. (Neo.) pluviale*. Inferior appendage ventromesal ridge with blunt apex.

Female. Head like that of *L. (Neo.) pluviale*. Wings brown, venation like that of *L. (Neo.) pluviale*. Genitalia (f. 166) having spermathecal sclerite with length and width subequal in ventral view and having deep dorsal emargination in lateral view.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 11 June - 26 August.

Distribution. Arizona, Colorado, New Mexico, Utah, and Wyoming.

Type data. *Lepidostoma ormea* Ross (1946): "*Holotype*. - male, Heber City, Utah, July 23, 1939, at light, Knowlton & Harmston." Holotype at the INHS (Webb 1980). See type material examined below.

Lepidostoma querla Denning (1949): "*Holotype*. - male, Oak Creek Canyon, Arizona, June 1942 (C. P. Alexander)." See type material examined below.

Lepidostoma moneka Denning (1968): "*Holotype*. - male, one mile south of Portal, Arizona, 8 August 1965, Mont A. Cazier." See type material examined below.

Material examined. Holotype male of *L. ormeum*, (INHS); holotypes male of *L. querlum* and *L. monekum*, (DGD). **ARIZONA**: Oak Creek Canyon, 4 males, 39 females, 18 VI 1968, OSF & Menke, (USNM); Apache Co: Little Colorado River, Hwy 373, Greer, 2 males, 4 females, 17 VII 1969, (USNM); Gila Co: Christopher Cr, Hwy 260, 3 males, 13 VI 1974, WPS, (USNM). **COLORADO**: Grand Co: Fraser River, Granby, male, 2 females, 4 VIII 1973, RWB & WPS, (BYUC); Eagle Co: Eagle River, Gypsum, 2 males, female, 10 VII 1973, RWB & WPS, (BYUC). **NEW MEXICO**: Catron Co: Whitewater Cr, Catwalk Picnic Area, 2 males, 2 females, 11 VI 1974, WPS, (USNM). **UTAH**: Duchesne Co: Uinta River, canyon summer homes, male, female, 7 VIII 1975, RWB, (BYUC).

Lepidostoma (Neodinarthrum) pluviale (Milne)
(f. 1, 151, 152, 160, 161, 167)

Olemira pluvialis Milne 1936:117, 123, 124 (male).

Lepidostoma rhino Ross 1946:268, 276, f. 4A-C (male, female) NEW SYNONYM; Fischer 1970:63; Flint and Bueno 1977:375, 377; Nimmo and Scudder 1978:120; Webb 1980:98; Nimmo and Scudder 1983:80.

Lepidostoma veleda Denning 1948b:20-21, pl. 4 f. 5-5C (male, female) NEW SYNONYM; Fischer 1970:68; Anderson 1976:124; LaFontaine 1981:249, 325; Roemhild 1982:11; Baumann and Unzicker 1981:27; Ruiter and Lavigne 1985:44; Herrmann et al. 1986:435-436; Ward 1986:191.

Lepidostoma pluviale: Fischer 1970:61; Anderson 1976:120; Solomon and Leiser 1977:172, 178; Nimmo and Scudder 1978:120; Schmid 1980:150, f. 542 (male); LaFontaine 1981:191, 249, 250, 251, 325; Baumann and Unzicker 1981:27; Roemhild 1982:11; McElhone and Davies 1983:2303; Nimmo and Scudder 1983:74, 80; Ruiter and Lavigne 1985:42; Herrmann et al. 1986:435; McElhone et al. 1987:281, 282.

This species is distinguished from other species of the *L. (Neo.) pluviale* group by having segment X with rounded apex extending beyond the small pair of lateral bifarious points in lateral view. The types of *L. rhino* and *L. veledum* were examined and compared with the holotype of *O. pluvialis* (the genitalia of the latter were cleared and illustrated for the first time). Significant variation was observed in segment X of males of *L. (Neo.) pluviale* from a single collection series (f. 161). Hence, considerable differences in male genitalia within a population of *L. (Neo.) pluviale* must be expected. The new synonyms listed above were based on this interspecific variation of male abdominal segment X.

Male. Head (f. 151) with scape 0.8 mm long, maxillary palps 0.8 mm long. Wings (f. 152) with anterior wing approximately 6.5 mm long. Genitalia (f. 160, 161). Segment X rounded apex extended beyond small lateral bifarious points; lateral processes each reduced to pair of small lateral bifarious points, one pointed dorsad and one ventrad. Phallus like that of other species in this group. Inferior appendage with blunt ventromesal ridge.

Female. Head typical of female Lepidostomatidae. Wings (f. 152) with anterior wing approximately 7.0 mm long, light brown. Genitalia (f. 167) with spermathecal sclerite somewhat pentagonal in ventral view, broad and dorsal margin with shallow emargination in lateral view.

Immatures, case and habitat. All larval instars have a smooth, slightly curved case of sand grains (f. 1). Larvae were reported by Ross (1946) to inhabit mountain streams.

Life history. Pupae collected 14 June to 31 July. Recorded flight dates: 30 May - 9 November.

Distribution. Alberta, Baja California Norte, British Columbia, California, Colorado, Idaho, Montana, New Mexico, Oregon, South Dakota, Utah, and Wyoming.

Type data. *Olemira pluvialis* Milne (1936): "*Holotype*. - male, 3 male *paratypes* 'Creede (8800'), Colo., 9-VII, F. M. Carpenter,' in the M.C.Z.; *allotype* female, 1 male, 1 female *paratypes*, 'Cultus L., B.C., 4-VII-1932, W. E. Ricker,' 2 males, 2 females, same data but 7-VI-1934, 23-VI-1932, 24-VI-1932, 9-XI-1933, respectively, in the author's collection; 11 other males from B.C. and Wyo., 29-V to 22-VII, 5 in the Can. Nat. Collection, 6 with the author." At the MCZC I have seen the male holotype, "M.C.Z. Type 22275"; and 5 paratypes (3 males and 2 females), "M.C.Z. Paratypes 22275." See type material examined below.

Lepidostoma rhino Ross (1946): "*Holotype*. - male, R. Santo Domingo, Rancho San Antonio, 1000' elevation, Baja California, Mexico, May 24, 1937, H. J. Rayner. *Allotype*. - female, same data as holotype. *Paratypes*. - 4 males, 4 females, same data as holotype." Holotype at the INHS (Webb 1980). See type material examined below.

Lepidostoma veleda Denning (1948b): "*Holotype* male, Albany County, Wyoming, Snowy Range Mountains, near Centennial, Wyoming, August 3, 1947 (D. G. Denning). *Allotype*. - female, same data as for holotype. *Paratypes*. - 5 males, 2 females, Woods Landing, Wyoming, August 10, 1947 (D. G. Denning); 3 males, Poudre River, 15 miles west of Teds Place, Colorado, August 17, 1947 (D. G. Denning); 3 males, 4 females, Poudre River, approximately 15 miles east of Cameron Pass, Colorado, August 19, 1947 (D. G. Denning); 10 males, Rocky Mountain National Park, Colorado, August 9, 1947 (D. G. Denning). In all instances the species was collected only from clear, swift flowing, mountain streams." Male and female paratypes in the INHS (pers. comm. J. D. Unzicker). See type material examined below.

Material examined. Holotype male, paratypes 2 males of *O. pluvialis*, (MCZC); holotype male, paratype female of *L. rhino*, (INHS); paratypes 2 males of *L. veledum*, (DGD). **ALBERTA:** Highwood River, Longview, 5 males, 4 females, 4 VIII 1968, APN, (UASM). **BRITISH COLUMBIA:** Penticton, Ellis Cr, at Hwy 97, male pupa, 4 pupae, 22 VI 1956, R Coleman, (USNM). **COLORADO:** Boulder Co: S St Vrain Cr, along Rt 7, W of Lyons, male pupa, 3 pupae, 31 VII 1966, (ROME); Middle Boulder Cr, Hwy 119, Burker Res., male, 6 VIII 1973, RWB & WPS, (USNM); Jefferson Co: Elk Cr, Hwy 285, 2 males, 2 females, 8 VIII 1973, RWB & WPS, (USNM). **IDAHO:** Teton River, Teton Basin, 4 males, 2 females, 11 VII 1966, R Nave, (USNM); Clearwater River, Wild Goose Cpg, immature 7 VII 1974 (male emerged 20 VII), R Rood, (OSUO); Blaine Co: Sawtooth Natl Forest, Warm Spring Cr, 16 males, 12 females, 30 VII 1978, RFS, (JSW); Ketchum, male, 27 VIII 1978, RFS, (JSW); Lemhi Co: 4.5 mi E of Carmen, Carmen Cr, 15 males, 26 females, 20 VII 1963, SDS, (JSW); Shoshone Co: 10 mi E of Avery, 24 males, 4 females, 23 VII 1966, DS Horning, (JSW); Valley Co: 1 mi S of Yellow Pine, 7 males, 24 females, 3 VIII 1964, SDS, (JSW). **MONTANA:**

Yellowstone Natl Pk, near Gardiner, 2 males, 2 females, 16 VIII 1962, PJ Spangler, (USNM). **NEW MEXICO**: Colfax Co: 2 mi SE of Eagle Nest, 6 males, 15 females, 15-16 VII 1974, EL Todd, (USNM); 5 mi W Ute Pk, 2 males, 13-18 VII 1974, EL Todd, (USNM); Lincoln Co: Rio Bonito, 1.5 mi W of Angus, male, 2 females, 16-17 VI 1980, MWS, (JSW). **OREGON**: Baker Co: Spring Cr, 2 males, 12 VI 1969; male, female, 9 VII 1969; 2 males, 4 females, 12 VII 1970, JHB, (USNM); Baker, Pine Cr, 4500', 4 males, 14 VII 1967, KG, (OSUO); N Powder River, 5 mi W of North Powder, 2 males, female, 13 VII 1964, NHA, (OSUO); Union Co: 21 mi SW of La Grande, Hwy 244, Meadow Cr, male pupa, 14 VI 1974, NHA, (OSUO). **SOUTH DAKOTA**: Hardy, 2 males, 7 VII 1965, RW Hodges, (USNM). **UTAH**: Cache Co: Logan, 4 males, 2 females, 24 VI 1974; 7 males, 6 females, 1 VII 1974; 7 males, 21 females, 8 VII 1973, GF Knowlton, (USNM); Logan Canyon, male, female, 4 VII 1937, Smith & Harmston, (USNM); Summit Co: Yellow Pine Cr, 7 mi E of Kamas, 4 males, female, 28 VII 1973, WPS, (USNM); Logan River, larvae, I 1952; male pupa, 8 VII 1952, O King, (USNM); Utah Co: America Fk Can, 2 males, 5 females, 19 VI 1976, RFS, (JSW); Wasatch Co: Daniels Cr, Whiskey Springs Picnic Area, male, 3 VIII 1973, RWB & WPS, (USNM); Lemmons Grove, Provo River, many adults, July, light trap, (BYUC). **WYOMING**: Yellowstone Natl Pk, Noris Cpg, 2 males, 22 VIII 1955, KM Fender, (USNM); Teton Co: 11 mi NE of Jackson, Gros Ventre, 7 males, 31 females, 29 VII 1978, (USNM).

Lepidostoma (Neodinarthrum) rayneri Ross
(f. 162, 168)

Lepidostoma rayneri Ross 1941:117-118, pl. 13 f. 96-96A (male); Fischer 1970:63; Anderson 1976:121-122; Nimmo and Scudder 1978:120; Webb 1980:98; LaFontaine 1981:251; Roemhild 1982:11. Nimmo and Scudder 1983:80;

Lepidostoma crypta Denning 1964:243-244, f. 4-4B (male) NEW SYNONYM.

Lepidostoma fischeri Denning 1968:67-68, f. 5-5B (male) NEW SYNONYM; Anderson 1976:119; McElravy and Resh 1987:88.

Similar to *L. (Neo.) errigenum* and *apornum*, this species differs by having segment X with a very reduced apicoventral hook and inferior appendage with a very broad ventromesal ridge with sharp apical angle extending to base of second article.

Male. Head and its appendages as in *L. (Neo.) pluviale*. Wings brown, venation and form like that of *L. (Neo.) pluviale*. Anterior wing 6.8 mm long. Genitalia (f. 162) having segment X in lateral view with lateral processes, each reduced to lateral pair of bifarious points, with ventral point smaller than dorsal point, additional minute points sometimes present on posterior face between bifarious points. Phallus like that of *L. (Neo.) pluviale*. Inferior appendage with ventromesal ridge broad and with sharp apical angle extending posteriorly to base of second article.

Female. Head like that of *L. (Neo.) pluviale*. Wings brown, venation like that of *L. (Neo.) pluviale*. Genitalia (f. 168) similar to those of *L. (Neo.) errigenum* and *ormeum*. Spermathecal sclerite very broad in ventral view, dorsal margin with deep, curved emargination in lateral view.

Immatures, case and habitat. Pupal cases similar to those of *L. (Neo.) pluviale*. Immatures inhabiting mountain streams.

Life history. Pupae collected 15 June to July. Recorded flight dates: 2 June - 1 August.

Distribution. British Columbia, California, Oregon, and Washington.

Type data. *Lepidostoma rayneri* Ross (1941): "*Holotype*. - male, Convict Creek, Mono County, California, August 1, 1938 (H. J. Rayner). *Allotype*. - female, same data as for holotype [INHS]. *Paratypes*. - 1 male, 1 female, same data as for holotype; 1 male, Molalla, Molalla River, Clackmas County, Oregon, July 1, 1935 (S. G. Jewett, Jr.). Paratypes are in the collection of Illinois Natural History Survey and The Academy of Natural Sciences of Philadelphia." Holotype at the INHS (Webb 1980). See type material examined below.

Lepidostoma crypta Denning (1964): "*Holotype*. - male, Scott Mountain, 19 air miles north of Trinity Center, Trinity County, California, 5300', 5 July 1963, C. D. MacNeill and V. B. Whitehead. The type is to be deposited in the collection of the California Academy of Sciences, Golden Gate Park, San Francisco, California." See type material examined below.

Lepidostoma fischeri Denning (1968): "*Holotype*. - male, Crater Lake National Park, Oregon, 31 July 1964, Joe Schul and J. D. Vertrees, collected in sphagnum bog." See type material examined below.

Material examined. Holotype male, allotype female of *L. rayneri*, (INHS); holotypes males of *L. cryptum* and *L. fischeri*, (DGD). **BRITISH COLUMBIA**: N of Vancover, Lynn Cr, male & female pupae, 18 VII 1946, HHR, (INHS). **CALIFORNIA**: Yosemite Natl Pk, Tuolumne River, male pupa, pupae, 16 VI 1961, GBW, (ROME); Stanislaus Natl Forest, Tuolumne River, pupae 18 VI 1961 (some reared to adult), GBW, (ROME); Madera Co: Central Camp, 5500', 9 males, 13 females, 30 VII 1983, J Larson, (DGD); Mono Co: Convict Cr, 7200', 20-21 July 1963, 5 males, 8 females, HDK, (USNM). **OREGON**: Ochoco Forest Cpg, near Pineville, 2 males, 12 females, 26 VII 1963, JHB, (USNM); Crook Co: Marks Cr, Hwy 26, 1 mi W of Ochoco Summit, pupae 15 VI 1974 (male & 3 females emerged 30 VI), NHA, (OSUO); Lane Co: 40 mi E of Eugene, 41 males, 14 females, 7 VI 1964, KG, (OSUO); Josephine Co: 4 mi N of Grants Pass, adults, 2 VI 1965, KG, (OSUO); Polk Co: Mill Cr, near Buell, male, 9 VII 1977, NHA, (OSUO). **WASHINGTON**: Okanogan Co: Winthrop, 2 males, 42 females, 26 VII 1962, JFG Clarke, (USNM).

Lepidostoma Subgenus *Lepidostoma* Rambur

This subgenus includes five North American species, *L. (L.) carolina, latipenne, stigma, tibiale*, and *togatum*, and the generotype, *hirtum* of Europe. The other species of *Lepidostoma* from the Old World are tentatively included in this subgenus, also.

Male. Head (f. 169) with scape usually shorter than that of female. Maxillary palps two-segmented with segmentation obscured, apical segment often flexible, extensible, and bearing scalelike setae. Wing venation of three types: (1) unique for *L. (L.) stigma* (f. 172); (2) similar for *L. (L.) latipenne* and *carolina* (f. 173); and (3) shared by *L. (L.) togatum* and *tibiale* (f. 174). Anterior wing with thyridial cell reduced or open, costal cell reduced to small setose basal pocket, modification of veins converging at arculus, *Cu*1 unbranched in *L. (L.) stigma, tibiale*, and *togatum*, small setose fold sometimes present in anal region, anal loops absent, in *L. (L.) latipenne* and *carolina* broad with *M* and posterior veins appressed together. Hindwing with *F*1 only, *R*5 fused with *R*4, *Cu*1 unbranched; 1+2*A* forming petiolate fork in *L. (L.) stigma, tibiale* and *togatum*, but fused completely in *L. (L.) latipenne* and *carolina*. Genitalia (f. 175-179) with segment IX short. Segment X with lateral processes (possibly intermediate appendages) usually horn-shaped and asymmetrical or reduced, dorsomesal process reduced to pair of small lobes. Phallus with phallic apodeme and phallobase short and collar-shaped, phallic shield with lateral straps articulating with basal plate of inferior appendages and lateral ventroposterior corners of segment X, endothecal membrane short, parameres absent, phalicata curved ventrad at base. Inferior appendages with main article long and narrow, apices acuminate or fingerlike; second article usually in subapical mesal position, but long and directed dorsoposteriorly in *L. (L.) latipenne* and *carolina*; vertical basodorsal process capitate; basomesal process absent in *L. (L.) tibiale*.

Female. Head (f. 170) with scape longer than that of male. Wings (f. 173, 174) typical of Lepidostomatidae. Genitalia (f. 180-184) having spermatheca with microtrichia forming conspicuous reticulate patterns, often being unique for species. Spermathecal sclerite usually broader than long in ventral view, sometimes with lateral processes in ventral view.

Immatures, case and habitat. Cases of immatures are typical panel type, usually tapered posteriorly and square in cross-section. In North America most lepidostomatids are endemic to mountain streams and springs, and certainly are most diversified in mountainous regions. However, North American species of this subgenus seem to be eurythermic, inhabiting environments such as third to fifth order streams or the littoral regions of lakes. This is suggested by the fact that in the southeastern Coastal Plains region (where few other lepidostomatids occur) *L. (L.) carolina* and *latipenne* are very common.

Distribution. Widespread throughout the Nearctic region, exclusive of the Southwest; Alabama and Georgia to Newfoundland to Oregon to Yukon.

Key to Adults of Nearctic *Lepidostoma (L.)* Species
(males and females)

1a. Male inferior appendage without basomesal process (f. 178); female spermatheca lightly reticulated anteriorly (f. 183); Georgia to Virginia .... *tibiale* (Carpenter), p. 89.
1b. Male inferior appendage with basomesal process (f. 175-177, 179); female spermatheca heavily reticulated anteriorly (f. 180-182, 184) 2

2a. Male scape with bizarre mesal process, bearing large saber-shaped seta and pair of capitate setae (f. 171); female spermatheca with anterior half strongly reticulated and constricted, fingerlike (f. 182); British Columbia to Montana to Oregon to Colorado .... *stigma* Banks, p. 88.
2b. Male scape without mesal process or with small mesal lobe (f. 170); female spermatheca oval, approximately a third or less of anterior portion reticulated (f. 180, 181, 184) 3

3a. Male lateral process of segment X horn-shaped (f. 179); female less than a third of anterior portion of spermatheca reticulate (f. 184); Alabama and Georgia to Newfoundland to Northwest Territories .... *togatum* (Hagen), p. 90.
3b. Male lateral horn-shaped processes of segment X absent or reduced (f. 175, 176); female with approximately a third of anterior portion of spermatheca reticulate (f. 180, 181) 4

4a. Large anterior wing, length greater than 7 mm; male inferior appendage with slender middorsal process extending obliquely above main process in lateral view (f. 176); female spermathecal sclerite wider than long in ventral view (f. 181); Georgia to Nova Scotia .... *latipenne* (Banks), p. 86.
4b. Small anterior wing, length less than 7 mm; male inferior appendage with broad middorsal process extended horizontally beyond main process in lateral view (f. 175); female spermathecal sclerite about as wide as long in ventral view (f. 180); North and South Carolina .... *carolina* (Banks), p. 85.

Lepidostoma (Lepidostoma) carolina (Banks)
(f. 175, 180)

Notiopsyche carolina Banks 1911:356-357, pl. 13 f. 28 (male).
Lepidostoma carolina: Wray 1967:56; Fischer 1970:39-40; Morse et al. 1980:91; Unzicker et al. 1982:9.106, 9.107.

This species is closely related to *L. (L.) latipenne*, but it is much smaller in size with anterior wing approximately 6 mm long. The male differs by having the inferior appendage second article with an oblique broad apex, extending posteriorly parallel to, and beyond the main article. The female spermatheca is also similar to that of *L. (L.) latipenne*, but its spermathecal sclerite is narrower in width about as wide as long in ventral view.

Male. Scape not highly modified, 0.9 mm long. Maxillary palps fingerlike, 0.5 mm long. Wings with venation similar to that of *L. (L.) latipenne*. Anterior wing brown, approximately 6.0 mm long, very broad, venation similar to that of *L. (L.) latipenne*. Hindwing about 5.0 mm long. Genitalia (f. 175) having segment X with lateral processes reduced to two small, slightly asymmetrical points at apices of mesal processes in dorsal view. Phallus without parameres, slightly curved near its base. Inferior appendage first article with fingerlike apex; second article parallel to first, and broadening towards its apex being truncated and flattened with two lateral points in dorsal view, ventromesal lobe extending below first article in lateral view.

Female. Scape 1.0 mm long. Wings brown, venation like that of *L. (L.) latipenne*. Anterior wing 6.0 mm long. Genitalia (f. 180) with anterior third of spermatheca reticulated. Spermathecal sclerite about as wide as long in ventral view.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 29 March - 19 November.

Distribution. This species is endemic to the Coastal Plains of North and South Carolina.

Type data. Banks (1911): "From Southern Pines, North Carolina, 23 April (Manee)." Ross (1938b): "*Lectotype.* - male, Southern Pines, North Carolina, April 28, A. H. Manee, No. 11704." I have seen the lectotype and one other male syntype at the MCZC.

Material examined. SOUTH CAROLINA: Aiken Co: Beulah Pond, near Windsor, 3 males, 20 V 1952, WH Cross, (INHS); 4 males, 15 IX 1974, PHC, (CUCC); Savannah River Plant, Upper Three Runs Creek, males, 19-20 XI 1976; 76 males, 3 females, 29 III 1977; 14 males, female, 22 VIII 1977; 61 males, 15-16 X 1977; DDH & SP, (CUCC); ibid, Tinker Cr, 6 males, 29 III 1977; male, 4 IX 1976, DDH & SP, (CUCC).

Lepidostoma (Lepidostoma) latipenne (Banks)
(f. 169, 170, 173, 176, 181)

Notiopsyche latipennis Banks 1905:216 (male).

Lepidostoma latipennis: Flint and Wiggins 1961:293, 295, f. 11A-B, (female); Wray 1967:56; Etnier and Schuster 1979:19; Neves 1979:171; Parker and Voshell 1981:6; Lake 1984:221.

Lepidostoma sp.: Unzicker 1968:4, 14, 19, 30, 50, 51, 69, f. 23, (female) [probably *latipenne*].

Lepidostoma latipenne: Fischer 1970:58-59; Roy and Harper 1975:1084; Roy and Harper 1979:162; Morse et al. 1980:91; Unzicker et al. 1982:9.106, 9.107.

This species is closely related to *L. (L.) carolina*, but somewhat larger, with anterior wing 8-9 mm in length. The male is distinguished by having inferior appendage with a long second article pointing dorsoposteriorly. The female's spermatheca is similar to that of *L. (L.) carolina*, but its spermathecal sclerite is much wider than long in ventral view.

Male. Head (f. 169) having scape 1.0 mm long with small rounded basomesal process and many stout setae. Maxillary palps highly modified with short cylindrical basal segment and flexible expansible apical segment bearing different types of modified setae, ventral setae usually more stout and dark brown, dorsal setae more scalelike and lighter in color. Mesonotum (f. 169) having scutellum without typical pair of mesal warts. Wings (f. 173) with anterior wing broad, approximately 8.5 mm long; veins of anterior region between *C* and *M* widely separated, but those of anal region closely appressed and converging at distal arculus, small basal fold along *Cu*2. Hindwing also broad with 1*A* and 2*A* fused. Genitalia (f. 176) having segment X lobelike without lateral processes. Phallus semicircular. Inferior appendage first article long and fingerlike with several large apical setae about as long as basodorsal process; second article sinuate, nearly as long as basodorsal process, pointing dorsoposteriorly and originating from midlength mesal position of first article; basomesal process slender.

Female. Head (f. 170) with scape 1.3 mm long. Mesonotum (f. 170) having scutellum with typical pair of mesal warts. Wings (f. 173) with anterior wing brown, 8.5 mm long. Genitalia (f. 181) with spermatheca similar to that of *L. (L.) carolina*, anterior third with reticulate pattern, but spermathecal sclerite slightly broader than long in ventral view.

Immatures, case and habitat. A few series of larvae have been associated with adults, but further study is necessary to determine their distinguishing characteristics. Larvae construct a panel type case which is square in cross section and slightly tapered posteriorly. Immatures are apparently endemic to second and third order streams of the Atlantic Coastal Plains and Piedmont regions.

Life history. Recorded flight dates: 15 April - 19 November.

Distribution. Alabama, Delaware, Georgia, New Hampshire, North Carolina, Nova Scotia, Pennsylvania, South Carolina, Tennessee, and Virginia.

Type data. Banks (1905): "One male from Black Mountains, North Carolina, June (Beutenmüller)." *Allotype*. - female (Carpenter 1933); Smoky Mountains, North Carolina, Bryson City, Deep Creek, 2000', 27 VIII 1930, P. J. Darlington.

Notiopsyche latipennis Banks, *New Lectotype*. - male, Black Mountains, North Carolina, VI, MCZC "Type 11703."

Material examined. ALABAMA: Talledega Natl Forest, Shoal Cr at Shoal Cr Cpg, male, 6 IX 1981, SCH & Handley, (SCH); Bibb Co: Little Schultz Cr at spring, male, 6 X 1982, SCH, (SCH). GEORGIA: Clarke Co: Beech Creek, 13 males, female, 5-6 V 1955; 12 males, female, 12-13 V 1955, DC Scott, (CUCC); Union Co: Vogel St Pk, Wolf Creek, 4 males, 30-31 V 1980; male, female, 22 VII 1972, JCM, (CUCC). NORTH CAROLINA: Swain Co: Great Smoky Mts Natl Pk, Mingus Cr, 7 males, female, 9-10 IX 1983, JSW, (JSW); Haywood Co: Great Great Smoky Mts Natl Pk, Chestnut Branch, at Big Cr Cpg, male, 21-22 VIII 1982, JSW & PJS, (JSW); Yancey Co: Black Mountains, South Toe River, 13 males, female, 2 IX 1978, JSW, (JSW). PENNSYLVANIA: Forest Co: Kellettville, Ross Run, 2 males, 27-28 VIII 1976, JSW, (JSW); Pigeon, Marienville Rod & Gun Club, Hatchery Spring, 3 males, 27-28 VII 1976, JSW, (JSW). SOUTH CAROLINA: Aiken Co: Savannah River Plant, Tinker Cr, 7 males, 4 females, 1 VI 1977; male, 4 IX 1976; male, 19-20 XI, DDH & SP, (CUCC); ibid, Upper Three Runs Creek, 2 female pupae, 28 June 1977, DDH & SP, (CUCC); Anderson Co: Broadway Watershed, Rock Cr, 3 males, 6 females, 3-4 VI 1980; 4 larvae, 31 III 1981, JSW & EM Taylor, (JSW); Pendleton, Aldwood, male, 1 V 1976, JCM, (CUCC); Oconee Co: Crane Cr, 5 mi N of Tamassee, 4 males, 26-27 V 1980, JSW & TRW, (JSW); 10 males, 7 females, 2-3 VI 1980, JSW & EMM, (JSW); E fork Chattooga River at US Fish Hatchery, N of Walhalla, 2 males, female, 18 VIII 1969; male, 13 VIII 1969, JCM, (CUCC); Pickens Co: Wildcat Cr, 9 km NW of Clemson, males & females, 15 IV-7 X 1968, JCM, PHC, (CUCC); 25 larvae, 28 III 1976, PHC; (CUCC); 4 larvae, 11 IV 1978, JSW & TRW, (JSW); Table Rock St Pk, Carrick Cr, male, 30 VII 1969, H Douglas, (CUCC); 2 males, 5 X 1969, JCM, (CUCC); Table Rock St Pk, S Saluda River, male, 29 V 1969; 1 male, 13 X 1969, JCM, (CUCC); Cleveland, S. Saluda River, 2 males, 27 VIII 1969, JCM, (CUCC); Rocky Bottom, Eastatoe Cr, male, 15 VI 1969, male, 15 VI 1969, male, 21 VIII 1969, JCM, (CUCC). TENNESSEE: Blount Co: Great Smoky Mts Natl Pk, Rabbit Cr, male, 22-23 VIII 1982, JSW & PJS, (JSW); Sevier Co: Great Smoky Mts Natl Pk, at Chimney Top, W Prong Little Pigeon River, male, 2 females, 15-16 VIII 1982, JSW & PJS, (JSW). VIRGINIA: Shenandoah Natl Pk, Thornton River, male, 2 IX 1961, OSF, (USNM).

Lepidostoma (Lepidostoma) stigma Banks
(f. 171, 172, 177, 182)

Lepidostoma stigma Banks 1907:125, pl. 8, f. 10 (female); Fischer 1970:64-65; Nimmo and Scudder 1983:74, 80; Nimmo and Wickstrom 1984:4.

Lepidostoma knowltoni Ross 1938a:175, f. 117 (male) NEW SYNONYM; Newell and Potter 1973:20; Fischer 1970:58; Anderson 1976:119; Webb 1980:97; LaFontaine 1981:250; Roemhild 1982:11; Baumann and Unzicker 1981:27; Ruiter and Lavigne 1985:41; Herrmann et al. 1986:434.

The associations of female with males for each of the five known North American species of the subgenus *Lepidostoma* and the examination of the female type of *L. stigma* Banks, revealed that *L. knowltoni* Ross is a junior synonym of *L. (L.) stigma*. The male genitalia are very similar to those of *L. (L.) togatum*, but *L. (L.) stigma* is distinguished by having a unique basomesal process on its antennal scape (f. 171). The anterior half of the female spermatheca is reticulated (f. 182); those of other species are no more than a third reticulated.

Male. Scape (f. 171) 1.0 mm long, with oblique mesal process bearing very large saber-shaped seta and two other stout capitate setae. Maxillary palp apparently similar to that of *L. (L.) togatum* with flexible setous apical segment. Wings brown. Anterior wing (f. 172) venation highly modified, fork of *M* long and narrow, *Cu*1 unbranched, *Cu*2 and 1*A* atrophied, 2*A* elongated and adjacent to *Cu*1, both *Cu*1 and 2*A* terminating distally in hind margin separately, 3*A* short and only vein terminating basally in hind margin, typical configuration of veins at arculus absent. Genitalia (f. 177) having segment X with long pair of asymmetrical, horn-shaped lateral processes, left one longer than right one in dorsal view. Phallus similar to that of *L. (L.) togatum*, parameres absent, phalicata curved near its base. Inferior appendage with first article acuminate in lateral view; second article subapical mesal process of first article, shorter than basodorsal process; basodorsal process long, clavate; basomesal process acuminate, about twice as long as its basal width.

Female. Antennal scape 1.2 mm long, cylindrical. Wing venation similar to that of *L. (L.) togatum*. Anterior wing about 9.0 mm long. Genitalia (f. 182) with anterior half of spermatheca cylindrical and conspicuously reticulate; spermathecal sclerite in ventral view with lateral processes truncated.

Immatures, case and habitat. Examination of one male pupa indicates that final instars of *L. (L.) stigma* construct typical panel cases, square sagittally with individual pieces square. Herrmann et al. (1986) reported that it inhabits rivers.

Life history. Pupae collected 12 July. Recorded flight dates: 8 July - 30 August.

Distribution. Northern Pacific Coastal region, central and northern Rocky Mountain regions including British Columbia, Colorado, Montana, Oregon, Utah, Yukon, and Wyoming.

Type data. *Lepidostoma stigma* Banks (1907): "One female from Colorado (Oslar), and two from Boulder, Colo., Aug. 9 (Cockerell), at light." Ross (1938b): "*Lectotype*. - female, Boulder, Colorado, August 9, at light, T. D. A. Cockerell, No. 11692." I have seen the lectotype and two other syntypes at the MCZC.

Lepidostoma knowltoni Ross (1938a): "*Holotype*. - male, Clinton, Utah, June 21, 1936, G. F. Knowlton. *Paratype*. - 1 male, Utah, same data as for holotype." Holotype at the INHS (Webb 1980).

Material examined. Lectotype female of *L. stigma,* (MCZC). **BRITISH COLUMBIA:** 2.7 km W of Topley, Hwy 16, 2 males, 18 VII 1979, APN, (CNCI); 1 km E of Redstone, Chilcotin River, Hwy 20, 13 males, 7 females, 16 VII 1979, APN, (CNCI). **OREGON:** Grant Co: Seneca, Silves River, male, 2 females, 1 VII 1976, SDS, (JSW); 1 mi NE of Tabernash, Meadow Cr, male, 7 VIII 1973, DLP, JP & SDS, (SDS); Harney Co: Blitzen River, 3 mi E of Frenchglen, 4400', male pupa, 3 pupae, collected 12 VII 1964 (2 males emerged 13 VIII), NHA, (OSUO & ROME). **YUKON:** Seaforth Cr, Alaska Hwy, 72.6 km W of Teslin Bridge, 9 males, 4 females, 24 VII 1979, APN, (UASM).

Lepidostoma (Lepidostoma) tibiale (Carpenter)
(f. 178, 183)

Neuropsyche tibialis Carpenter 1933:39, pl. 1 f. 3, pl. 2 f. 15, 16 (male, female).
Lepidostoma rileyi Denning 1948a:257, f. 9-9B, 10-10B (male, female); Wray 1967:56; Fischer 1970:66.
Lepidostoma tibialis: Wray 1967:56; Etnier and Schuster 1979:20; Parker and Voshell 1981:6.
Lepidostoma tibiale: Fischer 1970:65-66; Unzicker et al. 1982:9.106, 9.107.

The male of this species is similar to that of *L. (L.) togatum,* but is distinguished by having its inferior appendage without basomesal process. The female is unique, having spermatheca with small clusters of microtrichia in a reticulate pattern anteriorly.

Male. Antennal scape 0.5 mm long, cylindrical. Maxillary palp similar to that of *L. (L.) togatum.* Wings brown, venation similar to that of *L. (L.) togatum.* Anterior wing about 5.0 mm long. Genitalia (f. 178). Segment X with small dorsomesal lobes and prominent horn-shaped lateral processes, left process slightly longer than right one in dorsal view. Phallus without parameres, phalicata not strongly curved at its base. Inferior appendage first article with rounded apex bearing several stout setae; second article subapical mesal lobe, much shorter than basodorsal process; basodorsal process clavate and long; basomesal process absent.

Female. Antennal scape 1.0 mm long. Wings with venation typical for female lepidostomatids. Anterior wing 6.0 mm long. Genitalia (f. 183) having spermatheca anterior third with many small clusters of microtrichia in reticulate pattern. Spermathecal sclerite with two small lateral lobes in ventral view.

Immatures, case and habitat. Unknown.

Life history. Recorded flight dates: 3 March - 27 August.

Distribution. Endemic to the southern Piedmont and Coastal Plains regions of Alabama, Georgia, North Carolina, South Carolina, Tennessee, and Virginia.

Type data. *Neuropsyche tibialis* Carpenter (1933): "*Holotype* (male) and *allotype*: Bryson City, Deep Creek, North Carolina, Aug. 27, 1930; P. J. Darlington, collector. *Paratypes*: 1 male, Bryson City, North Carolina, Aug 23; 7 males, Bryson City, Aug. 26; 3 males, Bryson City, Aug 27; 2 males, Bryson City, Aug. 23; 3 females, Bryson City, Aug. 26; 1 female, Nantahala Gorge, North Carolina, Aug. 25, 1930. All types in the Museum of Comparative Zoology." Male syntype in the INHS (J. D. Unzicker). At the MCZC I have seen the male type, "M.C.Z. Type 19442"; and 14 paratypes (9 males, 5 females), "M.C.Z. Paratype 19442."

Lepidostoma rileyi Denning (1948a): "*Holotype.* - male, Ela, North Carolina, May 30, 1941, S. S. Easter. *Allotype.* - female, same data as holotype. *Paratypes.* - 2 females, same data as holotype. Types deposited in the entomological collection of the University of Minnesota.

Material examined. **ALABAMA:** Cheaha Cr, upstream of L. Chinnabee, Mt. Cheaha St Pk, male, 27 V 1981, SCH & O'Neil, (SCH). **GEORGIA:** Union Co: Baxter, Toccoa River, Hwy 60, male, 7 females, 25 IX 1972, (INHS). **SOUTH**

CAROLINA: Oconee Co: Chattooga River, Hwy 28, 2 males, 22 females, 16 VII 1969, JCM, (CUCC). VIRGINIA: Giles Co: New River, McCoy, male, IX 1973, B Strickler, (USNM); New River, 5 mi N of Radford, male, 2 VI 1971, AB Gurney, (USNM).

Lepidostoma (Lepidostoma) togatum (Hagen)
(f. 174, 179, 184)

Mormomyia togata Hagen 1861:273.
Silo pallidus Banks 1897:29.
Pristosilo canadensis Banks 1899:212 (male).
Lepidostoma togatum: Ellis 1962:5, 14; Etnier 1965:151; Blickle and Morse 1966:11; Wray 1967:56; Unzicker 1968:4, 14, 19, 50, 51, f. 24 (female); Fischer 1970:66-67; Unzicker et al. 1970:174; Hilsenhoff et al. 1972:22, 28; Longridge and Hilsenhoff 1973:180; Roy and Harper 1975:1085; Resh 1975:15; Hilsenhoff 1975:25; Roy and Harper 1979:163; Williams and Williams 1979:2407, 2410; Etnier and Schuster 1979:20; Masteller and Flint 1979:169; Neves 1979:171; Mingo and Gibbs 1980:46; Schmid 1980:150, f. 528-529, 531-539 (male, female); Parker and Voshell 1981:6; LaFontaine 1981:249, 250, 251; Hilsenhoff 1981:31; Unzicker et al. 1982:9.106, 9.107; Marshall and Larson 1982:78, f. 154; Huryn and Foote 1983:792; Lake 1984:221; Nimmo 1986b:96.
Goerodes togatum: Corbet et al. 1966:1293; Nimmo 1966:692.

This species is very similar to the generotype, *L. (L.) hirtum*, of Europe. It differs only in respect to minor details of the male anterior wing and genitalia. In comparison to the North American species, the male of *L. (L.) togatum* is most similar to that of *L. (L.) stigma*, from which it differs by not having a highly modified antennal scape; *L. (L.) togatum* and *stigma* are apparently allopatric species.

Male. Scape about 0.7 mm long and with short, rounded mesal bump bearing several long stout setae. Maxillary palp two-segmented, basal segment sclerotized, apical segment flexible and with many scalelike setae. Wings (f. 174). Anterior wing 8.0 mm long, with small basal costal cell bearing many stout setae, *F*1 and *F*3 present, *Cu*1 unbranched, and anal region with basal setose pouch. Genitalia (f. 179) having segment X with small pair of dorsomesal lobes and large, horn-shaped, asymmetrical lateral processes, right process longer than left one in dorsal view. Phallus without parameres, phalicata curved near its base. Inferior appendage first article fingerlike with several stout apical setae; second article short, subapical mesal lobe; basodorsal process clavate and long; basomesal process acuminate, about four times as long as its basal width.

Female. Antennal scape 1.0 mm long. Wings (f. 174). Genitalia (f. 184, 199) having spermatheca with less than a fourth of its anterior portion reticulate. Spermathecal sclerite in ventral view with pair of lateral processes truncated obliquely. Unzicker (1968: f. 24) provided illustrations of female genitalia which are apparently of this species; his figure shows an extra spermathecal pouch which is not shown in f. 199.

Immatures, case and habitat. Immatures inhabit lentic and lotic habitats indicating that the ecological range of *L. (L.) togatum* is very wide.

Life history. Mature pupae collected 10 April to 16 July. Recorded flight dates: 9 April - 30 September.

Distribution. This species is the most widespread lepidostomatid in North America. It occurs throughout most of the USA and Canada east of the Rocky Mountains; Alabama, Alberta, Arkansas, Connecticut, Delaware, District of Columbia, Georgia, Kentucky, Maine, Maryland, Michigan, Minnesota, Missouri, Newfoundland, New Hampshire, New York, North Carolina, North Dakota, Northwest Territories, Ohio, Ontario, Pennsylvania, Quebec, Rhode Island, Saskatchewan, South Carolina, Tennessee, West Virginia, and Wisconsin.

Type data. *Mormomyia togata* Hagen (1961): "Hab. Washington; St. Lawrence River, Canada (Osten Sacken)." Ross (1938b): "*Lectotype*. - female, St. Lawrence River, Canada, 1859, Osten Sacken, No. 10942." I have seen the lectotype and one other syntype at the MCZC.

Silo pallidus Banks (1897): "Several specimens from Ithaca, N.Y." *New Lectotype*. - male, Ithaca, New York, 2 July, without a red type label, selected by Ross, 1973, but unpublished. One syntype female, same data, but with red MCZC label, "Type 11690."

Pristosilo canadensis Banks (1899): "Sherbrooke, Canada, June (Bégin)." *New Lectotype*. - male, same data as above, MCZC "Type 11689."

Material examined. ALABAMA: Cheaha Cr upstream of L. Chinnabee, Mt. Cheaha St Pk, male, 22 V 1981, SCH & O'Neil, (SCH); Conecuh Co: Sepulga R., Hwy 31, male, 4 IX 1982, SCH, (SCH). **ALBERTA**: Edmonton, male, female, 17 VII 1955, GE Ball, (UASM); Muskeg River, N of Ft McMurry, male pupa, 21 VI 1978, APN, (UASM); Sturgeon River, Hwy 43, 2 mi W of Onoway, male, 9 females, 18 VI 1966, APN, (UASM); Sundance, male, 38 females, 23 VII 1955, B Hockin, (UASM); LaBiche River, Hwy 63, male, 29 VI 1978, APN, (UASM); Wandering River, Hwy 63, male, 29 VI 1978, APN, (UASM); Blindman River, Hwy 12, Rimbey, 10 males, 7 females, 25 VI 1967, APN, (UASM); Lesser Slave Lake, E of Wagner, male, female, 19 VII 1965, APN, (UASM). **MAINE**: Aroostook Co: Big Black River (T15 R13), male, female, 25 VII 1961, A Brower, (USNM); Oxbow, male, 5 females, 9-10 VII 1961, A Brower, (USNM). **MARYLAND**: Plummer's Isl., male, EA Schwartz, (USNM). **MISSOURI**: Carter Co: Big Spring St Pk, male, 19 V 1972, RWB, (USNM); Iron Co: Annapolis, Champion Spring, male pupa, 5 larvae, 10 IV 1950, GA Ulrich, (INHS); Maries Co: Paydown Spring, Hwy 42, 7 mi W of Belle, 10 males, 3 females, 27 V 1972, BA Sussman, (USNM); Oregon Co:, Graveyard Spring, male, 12 IV 1972, RWB, (USNM); Shannon Co: Alley Spring, Ozark Natl Riverway, 60 males, 15 females, 19 V 1972, RWB, (USNM); Ibid, 19 males, 20 females, 28 V 1973, JCM, (CUCC); Round Spring, Hwy 19, 54 males, 15 females, 19 V 1972, RWB, (USNM). **NEW JERSEY**: Sussex Co: Colesville, Clove Brook, 10 males, 2 females, 11 VI 1977, DE Ashton & JSW, (JSW). NEW YORK: Lewis Co: Whetstone, Gulf St Pk, male, 3 females, 21 VI 1973, JCM, (CUCC). **NORTHWEST TERRITORIES**: Great Slave Lake, Simpson Isl, 2 males, 14 VII 1964; male, 21 VII 1964, D Larson, (UASM). **NOVA SCOTIA**: Queens Co: Lake Kejimkujik, male, female, 15 VI 1958, male, 7 females, 2 VII 1957; 6 females, 1961, DC Ferguson, (USNM). **PENNSYLVANIA**: Pike Co: Metamoras, Delaware River, 6 males, 12 females, 11 VI 1977, DE Ashton & JSW, (JSW). **QUEBEC**: Norway Bay, 9 males, 21 females, 4-10 VII 1974, OSF, (USNM). **RHODE ISLAND**: Washington Co: Richmond, 2 females, 20 VI 1971, AG Lavallee, (CUCC). **SASKATCHEWAN**: Makwar, Hwy 55, Rapid View male, 4 females, 20 VI 1979, APN, (UASM); Sandy Lake, Prince Albert Natl Pk, larva, male pupa, 16 VII 1970, ROME staff, (ROME). **SOUTH CAROLINA**: Oconee Co: Chattooga River, Hwy 28, 2 males, 10 IX 1969, JCM, (CUCC). **VIRGINIA**: Pulaski Co: New River, 5 mi N of Radford, male, 2 VI 1971, AB Gurney, (USNM). **WEST VIRGINIA**: Pendleton Co: Smoke Hole St Pk, Briggs Run, male, female, 9 IV 1977, D & M Davis, (USNM). **WISCONSIN**: Douglas Co: Gordon, male, 2 females, 20 VII 1967, A Lemke, (USNM).

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LIST OF FIGURES

Figures 1-6. Larval cases:
1. *Lepidostoma pluviale*, stone case.
2. *Lepidostoma libum*, stone case.
3. *Lepidostoma acarolum*, stone case.
4. *Lepidostoma ontario*, panel case.
5. *Lepidostoma knulli*, turret case.
6. *Lepidostoma frosti*, turret case.

Figures 7-9. Larval heads, ventral:
7. *Theliopsyche melas*.
8. *Lepidostoma ontario*.
9. *Lepidostoma frosti*.

Figures 10-13. SEM micrographs:
10. *Theliopsyche corona*, modified seta of male forewing, 2,000 X.
11. *Lepidostoma griseum*, male: A, mesonotum, 120 X; B, tibial spurs, 110 X.
12. *Lepidostoma americanum*, setae of the costal cell, male forewing: A, 500 X; B, 1,000 X; C, 2,000 X.
13. *Lepidostoma cascadense*, setae in male forewing anal fold: A, 200 X; B, 500 X.

Figures 14-18. Secondary sexual characteristics of *Theliopsyche*:
14. *Theliopsyche corona*, male head and thorax, left lateral.
15. *Theliopsyche corona*, male: A, head, pronotum and mesonotum, dorsal; B, right tibiae and tarsi, mesal.
16. *Theliopsyche corona*, wings: A, male; B, female.
17. *Theliopsyche parva*: A, male wings; B, female hindwing.
18. *Theliopsyche melas*, male hindwing.

Figures 19-23. Male genitalia of *Theliopsyche*, left lateral (A); terga IX and X, dorsal (B); left inferior appendage, dorsal (C); phallus, dorsal (D):
19. *Theliopsyche corona*, North Carolina, Wild Cherry Branch.
20. *Theliopsyche epilonis*, holotype.
21. *Theliopsyche grisea*, Pennsylvania, Whisky Spring.
22. *Theliopsyche melas*, paratype.
23. *Theliopsyche parva*, lectotype: E, segment VII, ventral.

Figures 24-26. Female genitalia, left lateral (A), and ventral (B):
24. *Theliopsyche corona*.
25. *Theliopsyche epilonis*.
26. *Theliopsyche parva*, lectoallotype.

Figures 27-56. Secondary sexual characteristics of *Lepidostoma* (*Nosopus*):
27. *Lepidostoma recinum*, male, head, left lateral.
28. *Lepidostoma licolum*, male: A, head, pronotum and mesonotum, dorsal; B, head, left lateral.
29. *Lepidostoma podagrum*, head, prothorax and foreleg, left lateral: A, male; B, female.
30. *Lepidostoma quercinum*, male: A, head, pronotum and mesonotum, dorsal; B, head, left lateral.
31. *Lepidostoma americanum*, male head, left lateral.
32. *Lepidostoma modestum*, male: A, head, pronotum and mesonotum, dorsal; B, head, left lateral.
33. *Lepidostoma cinereum*, male, left scape, dorsal.

34. *Lepidostoma unicolor*, male, head, pronotum and mesonotum, dorsal.
35. *Lepidostoma mexicanum*, male, head, left lateral.
36. *Lepidostoma cascadense*, male: A, left scape, dorsal; B, maxillary palp, extended, left lateral; C, mesoscutellum, dorsal.
37. *Lepidostoma hoodi*, male, head, left lateral.
38. *Lepidostoma spicatum*, male: A, head, dorsal; B, left scape, mesal portion expanded, dorsal; C, head, left lateral.
39. *Lepidostoma verodum*, male head, left lateral.
40. *Lepidostoma reosum*, male wings.
41. *Lepidostoma asteneum*, male wings.
42. *Lepidostoma jewetti*, male wings.
43. *Lepidostoma licolum*, male wings.
44. *Lepidostoma americanum*, male wings.
45. *Lepidostoma podagrum*, wings: A, male; B, female.
46. *Lepidostoma modestum*, wings: A, male; B, female.
47. *Lepidostoma unicolor*, wings: A, male; B, female.
48. *Lepidostoma roafi*, male wings.
49. *Lepidostoma delongi*, male wings.
50. *Lepidostoma acarolum*, male wings.
51. *Lepidostoma frontale*, male wings.
52. *Lepidostoma heveli*, male wings.
53. *Lepidostoma lacinatum*, male wings.
54. *Lepidostoma hoodi*, wings: A, male; B, female.
55. *Lepidostoma cascadense*, wings: A, male; B, female.
56. *Lepidostoma verodum*, wings: A, male; B, female.

Figures 57-96. Male genitalia of *Lepidostoma* (*Nosopus*), left lateral (A); terga IX and X (B); left inferior appendage, dorsal (C); phallus, left lateral (D); phallus, dorsal (E):

57. *Lepidostoma reosum*, holotype.
58. *Lepidostoma asteneum*, holotype.
59. *Lepidostoma recinum*, holotype.
60. *Lepidostoma jewetti*, holotype.
61. *Lepidostoma licolum*, paratype.
62. *Lepidostoma americanum*, Pennsylvania, Maul Spring.
63. *Lepidostoma bryanti*, Pennsylvania, Ross Run.
64. *Lepidostoma costale*, Pennsylvania, Pigeon.
65. *Lepidostoma prominens*, Quebec, Grand Lac Jaques Cratier.
66. *Lepidostoma podagrum*, Idaho, Teton River.
67. *Lepidostoma quercinum*, Oregon, Camp Adair.
68. *Lepidostoma roafi*, Washington, Cle Elum River.
69. *Lepidostoma compressum*, paratype.
70. *Lepidostoma lydia*, Pennsylvania, Maul Spring (phallus expanded).
71. *Lepidostoma modestum*, North Carolina, Whitewater Falls: (phallus expanded) F, phallus, ventral.
72. *Lepidostoma ontario*, New Hampshire, Mt. Pleasant Brook.
73. *Lepidostoma pictile*, New York, Allegany State Park (phallus expanded).
74. *Lepidostoma bakeri*, paratype.
75. *Lepidostoma cinereum*, Washington, Yakima River: F, phalicate and paremeres, dorsal.
76. *Lepidostoma frosti*, Pennsylvania, Maul Spring.
77. *Lepidostoma knulli*, holotype.
78. *Lepidostoma unicolor*, Idaho, Wind Lake.
79. *Lepidostoma acarolum*, New Mexico, Glenwood.
80. *Lepidostoma aztecum*, holotype.
81. *Lepidostoma delongi*, Sonora, Esperanza.
82. *Lepidostoma denningi*, holotype.
83. *Lepidostoma frontale*, holotype.

84. *Lepidostoma heveli*, holotype.
85. *Lepidostoma lacinatum*, paratype.
86. *Lepidostoma mexicanum*, Arizona, Portal: F, phalicata and parameres, dorsal.
87. *Lepidostoma quila*, paratype.
88. *Lepidostoma rectangulare*, holotype.
89. *Lepidostoma reimoseri*, paratype.
90. *Lepidostoma stienhauseri*, holotype.
91. *Lepidostoma talamancense*, Costa Rica, Ojo de Aqua.
92. *Lepidostoma ermanae*, holotype.
93. *Lepidostoma hoodi*, Washington, Minotaur Creek.
94. *Lepidostoma spicatum*, paratype.
95. *Lepidostoma cascadense*, holotype.
96. *Lepidostoma verodum*, California, Sagehen Creek.

Figures 97-121. Female genitalia of *Lepidostoma* (*Nosopus*), left lateral (A) and spermathecal sclerite, ventral (B):
97. *Lepidostoma recinum*.
98. *Lepidostoma jewetti*.
99. *Lepidostoma americanum*.
100. *Lepidostoma bryanti*.
101. *Lepidostoma costale*.
102. *Lepidostoma prominens*.
103. *Lepidostoma podagrum*.
104. *Lepidostoma quercinum*.
105. *Lepidostoma roafi*.
106. *Lepidostoma lydia*.
107. *Lepidostoma modestum*.
108. *Lepidostoma ontario*.
109. *Lepidostoma pictile*.
110. *Lepidostoma bakeri*.
111. *Lepidostoma cinereum*.
112. *Lepidostoma frosti*.
113. *Lepidostoma knulli*.
114. *Lepidostoma unicolor*.
115. *Lepidostoma acarolum*.
116. *Lepidostoma mexicanum*.
117. *Lepidostoma cascadense*.
118. *Lepidostoma ermanae*.
119. *Lepidostoma hoodi*.
120. *Lepidostoma verodum*.
121. *Lepidostoma deceptivum*, lectotype: C, spermatheca, left lateral.

Figures 122-126. Secondary sexual characteristics of *Lepidostoma* (*Mormomyia*):
122. *Lepidostoma griseum*, male: A, head, left lateral; B, mesonotum, dorsal.
123. *Lepidostoma morsei*, male mesonotum, dorsal.
124. *Lepidostoma vernale*, male: A, head, pronotum and mesonotum, dorsal; B, head, left lateral.
125. *Lepidostoma griseum*, wings: A, male; B, female.
126. *Lepidostoma vernale*, wings: A, male; B, female.

Figures 127-144. Male genitalia of *Lepidostoma* (*Mormomyia*), left lateral (A); terga IX and X (B); inferior appendages, dorsal (C); phallus, left lateral (D); phallus, dorsal (E):
127. *Lepidostoma griseum*, Pennsylvania, Maul Spring.
128. *Lepidostoma morsei*, holotype.
129. *Lepidostoma carrolli*, paratype: F, phallus expanded, left lateral.
130. *Lepidostoma serratum*, holotype.
131. *Lepidostoma etnieri*, holotype.

132. *Lepidostoma excavatum*, holotype.
133. *Lepidostoma libum*, holotype.
134. *Lepidostoma sommermanae*, Pennsylvania, Maul Spring.
135. *Lepidostoma flinti*, paratype.
136. *Lepidostoma glenni*, holotype.
137. *Lepidostoma sackeni*, Pennsylvania, Maul Spring.
138. *Lepidostoma vernale*, Pennsylvania, Chestnut Bridge Hollow.
139. *Lepidostoma lobatum*, holotype.
140. *Lepidostoma mitchelli*, holotype.
141. *Lepidostoma styliferum*, holotype.

Figures 142-150. Female genitalia of *Lepidostoma* (*Mormomyia*), left lateral (A) and spermathecal sclerite, ventral (B):
142. *Lepidostoma griseum*.
143. *Lepidostoma serratum*.
144. *Lepidostoma excavatum*.
145. *Lepidostoma libum*.
146. *Lepidostoma sommermanae*.
147. *Lepidostoma flinti*.
148. *Lepidostoma sackeni*.
149. *Lepidostoma vernale*.
150. *Lepidostoma mitchelli*.

Figures 151-153. Secondary sexual characteristics of *Lepidostoma* (*Neodinarthrum*):
151. *Lepidostoma pluviale*, male: A, head, pronotum and mesonotum, dorsal; B, head, left lateral.
152. *Lepidostoma pluviale*, wings: A, male; B, female.
153. *Lepidostoma canthum*, forewings: A, male; B, female.

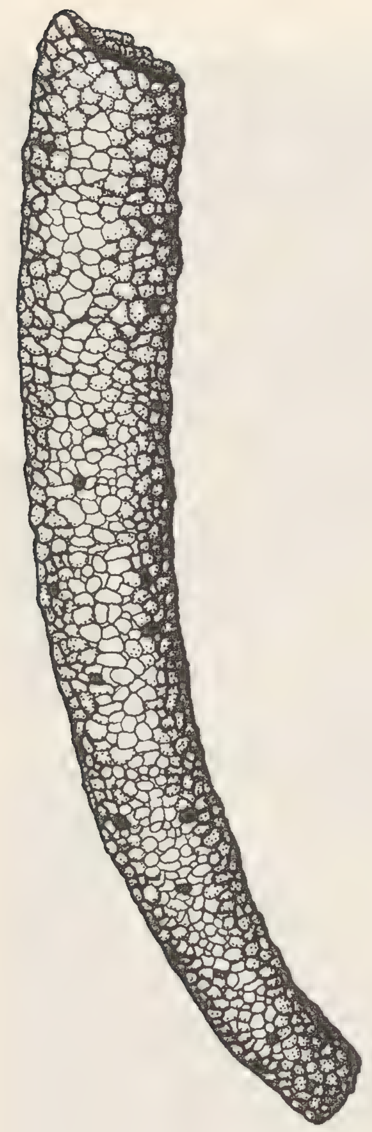
Figures 154-162. Male genitalia of *Lepidostoma* (*Neodinarthrum*), left lateral (A); terga IX and X, dorsal (B); left inferior appendage, ventral (C); left inferior appendage, dorsal (D); phallus, left lateral (E):
154. *Lepidostoma canthum*, California, Potreros.
155. *Lepidostoma baxea*, holotype.
156. *Lepidostoma apornum*, holotype.
157. *Lepidostoma errigenum*, paratype.
158. *Lepidostoma lotor*, holotype.
159. *Lepidostoma ormeum*, holotype.
160. *Lepidostoma pluviale*, holotype: F, segment X, caudal.
161. *Lepidostoma pluviale*, segment X, left lateral of 12 males from the same light trap collection, Utah, Provo River.
162. *Lepidostoma rayneri*, holotype.

Figures 163-168. Female genitalia of *Lepidostoma* (*Neodinarthrum*), left lateral (A) and spermathecal sclerite, ventral (B):
163. *Lepidostoma baxea*.
164. *Lepidostoma canthum*.
165. *Lepidostoma errigenum*.
166. *Lepidostoma ormeum*.
167. *Lepidostoma pluviale*: C, spermathecal sclerite, vagina and segment IX, ventral; D, segments VII, VIII and IX, ventral; E, spermathecal sclerite and vagina, lateral.
168. *Lepidostoma rayneri*.

Figures 169-174. Secondary sexual characteristics of *Lepidostoma* (*Lepidostoma*):
169. *Lepidostoma latipenne*, male: A, male head, pronotum and mesonotum, dorsal; B, male head, maxillary palp expanded, left lateral; C, male maxillary palp contracted, left lateral.
170. *Lepidostoma latipenne*, female: A, head, dorsal; B, mesoscutellum, dorsal.
171. *Lepidostoma stigma*, male, left scape, dorsal.
172. *Lepidostoma stigma*, male forewing.
173. *Lepidostoma latipenne*, wings: A, male; B, female.
174. *Lepidostoma togatum*, wings: A, male; B, female.

Figures 175-179. Male genitalia of *Lepidostoma* (*Lepidostoma*), left lateral (A); terga IX and X, dorsal (B); left inferior appendage, dorsal (C); phallus, left lateral (D):
175. *Lepidostoma carolina*, South Carolina, Upper Three Runs Creek.
176. *Lepidostoma latipenne*, South Carolina, Crane Creek.
177. *Lepidostoma stigma*, Oregon, Senica.
178. *Lepidostoma tibiale*, South Carolina, Chattooga River.
179. *Lepidostoma togatum*, Pennsylvania, Delaware River.

Figures 180-184. Female genitalia of *Lepidostoma* (*Lepidostoma*), left lateral (A) and spermathecal sclerite, ventral (B); spermatheca, left lateral (C):
180. *Lepidostoma carolina*.
181. *Lepidostoma latipenne*.
182. *Lepidostoma stigma*.
183. *Lepidostoma tibiale*.
184. *Lepidostoma togatum*.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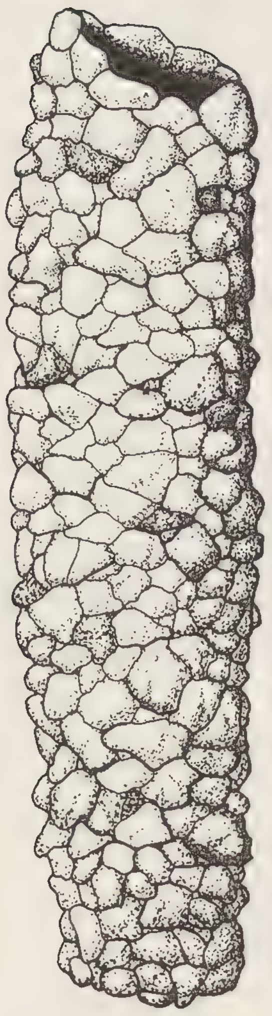
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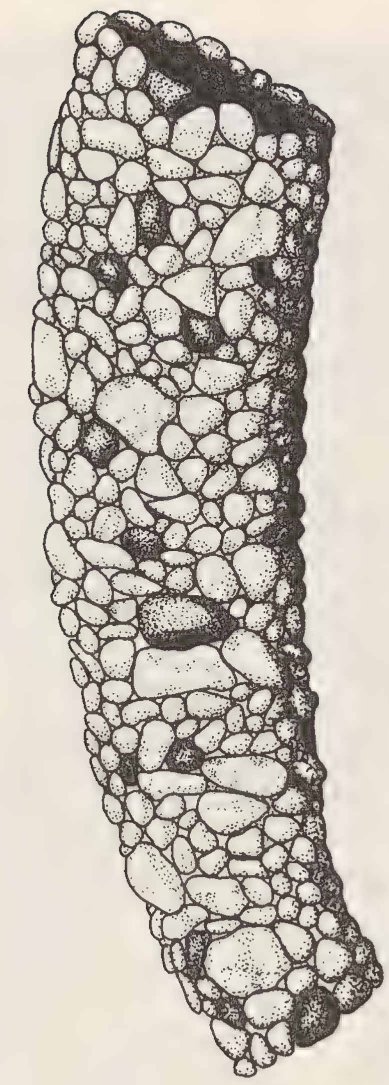
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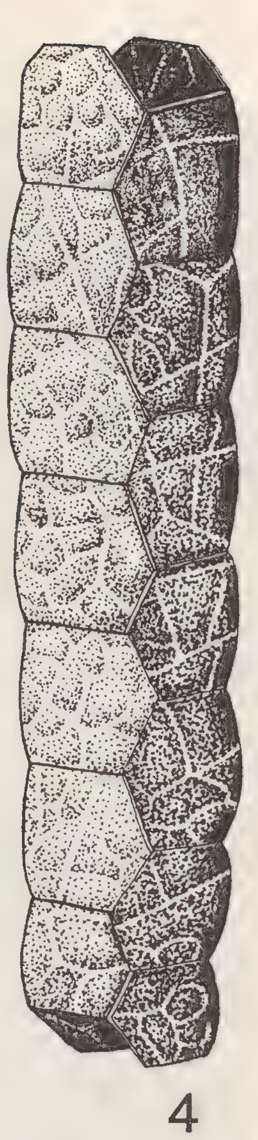
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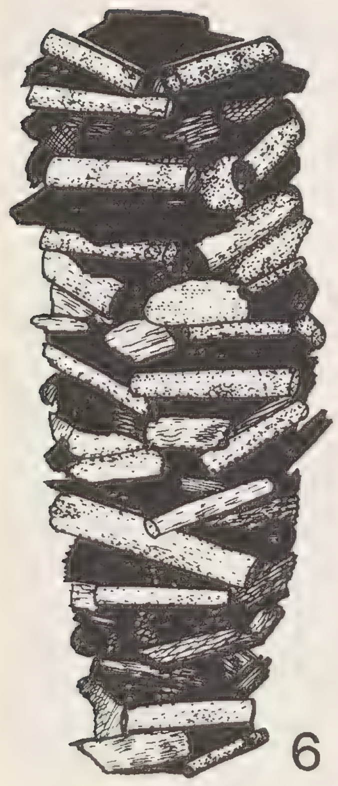
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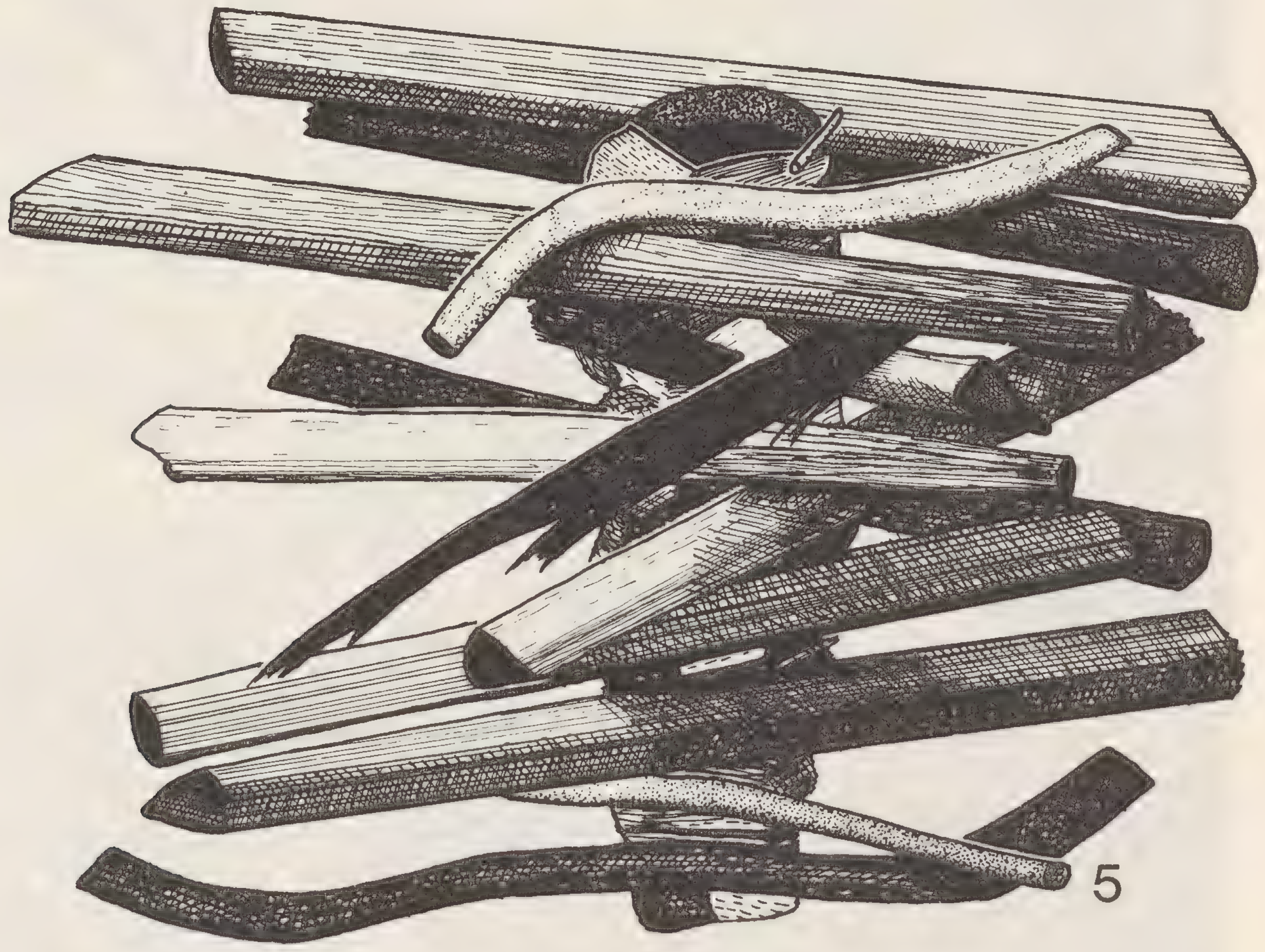
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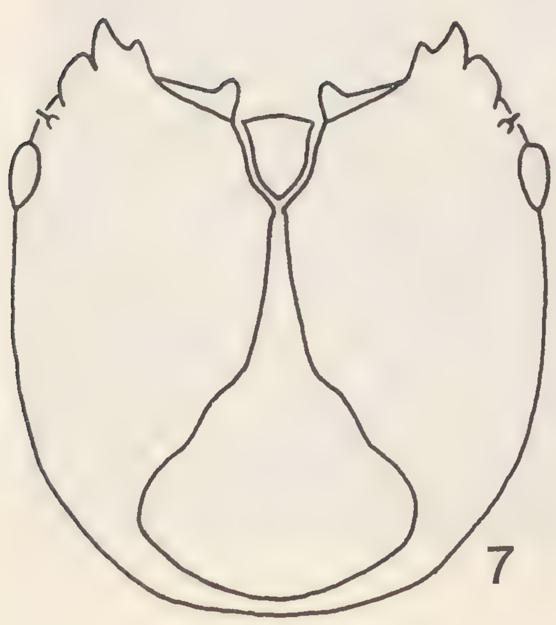
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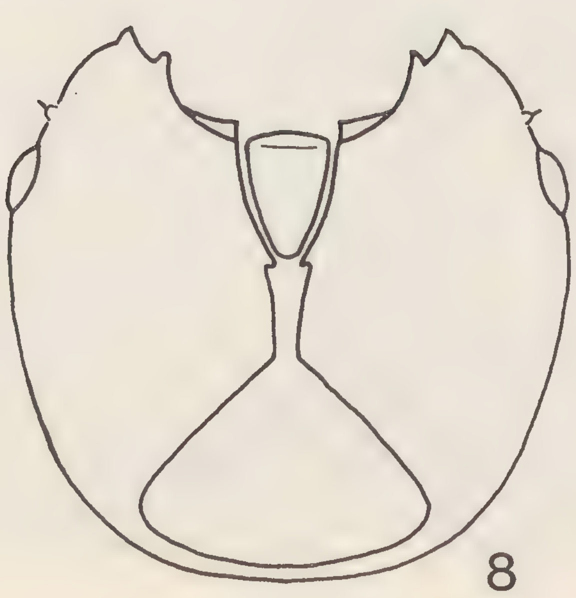
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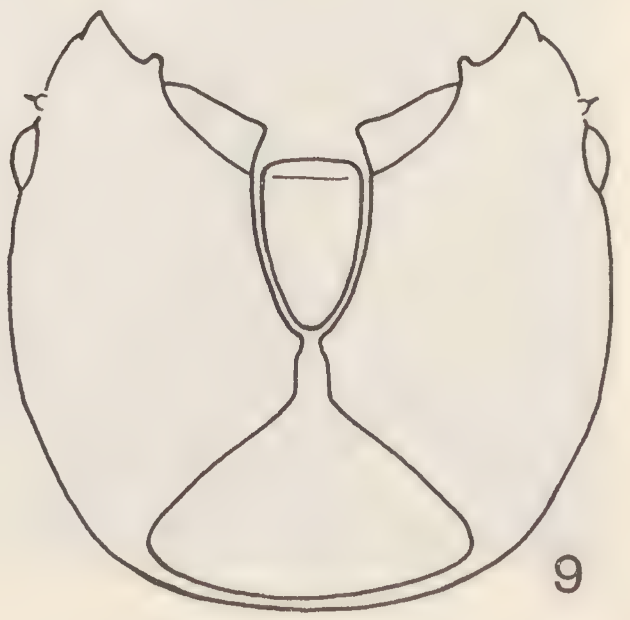
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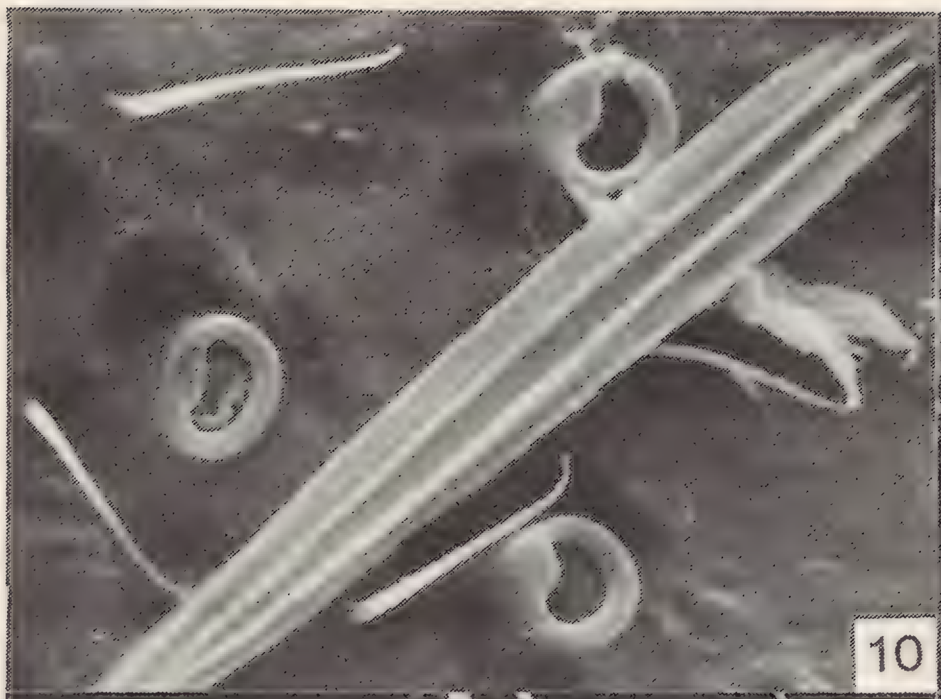
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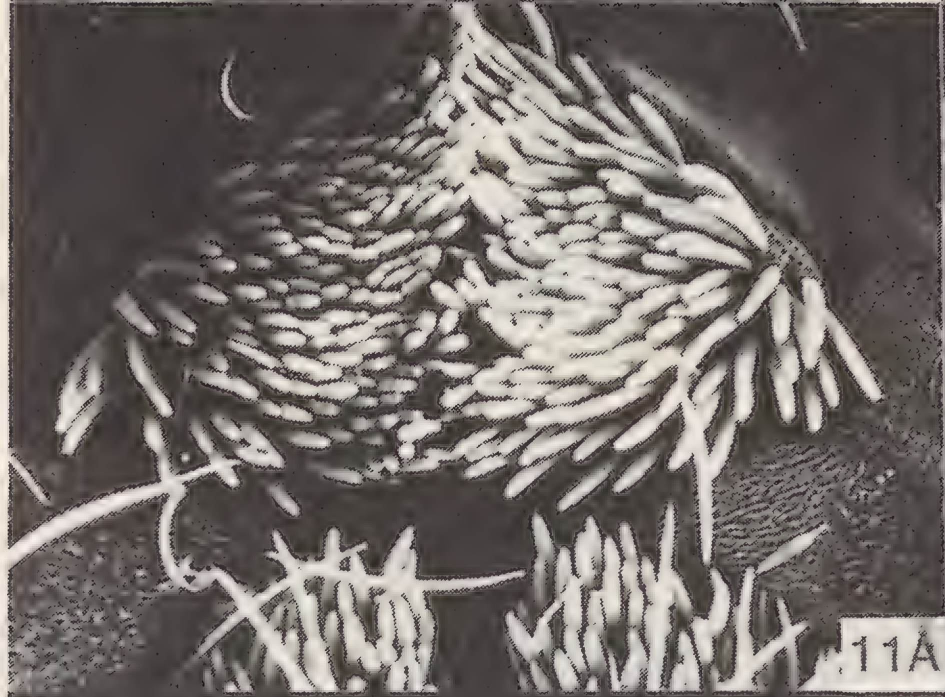
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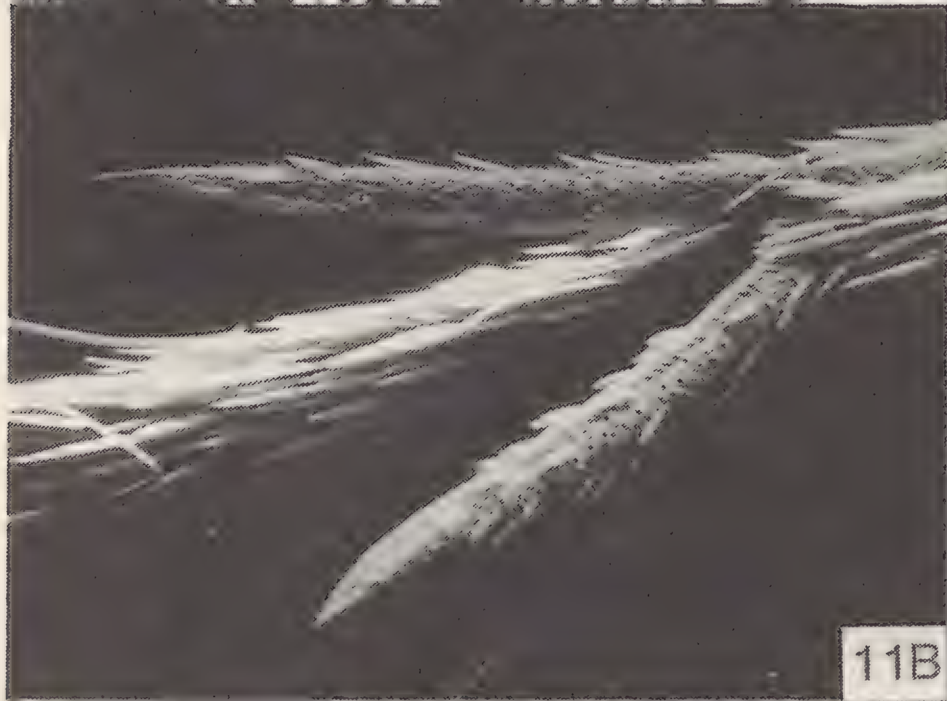
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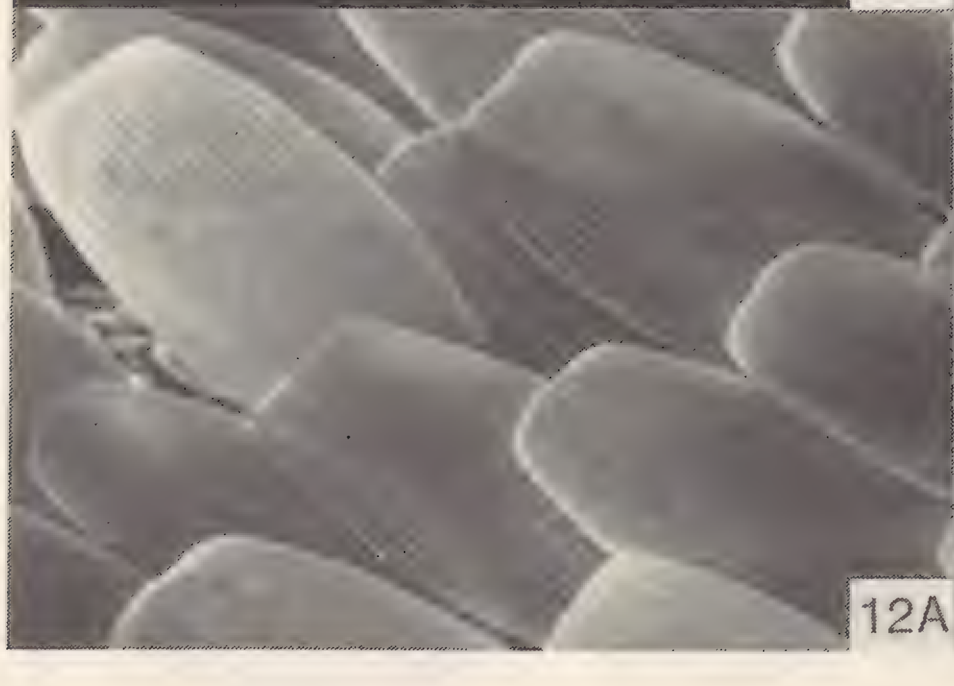
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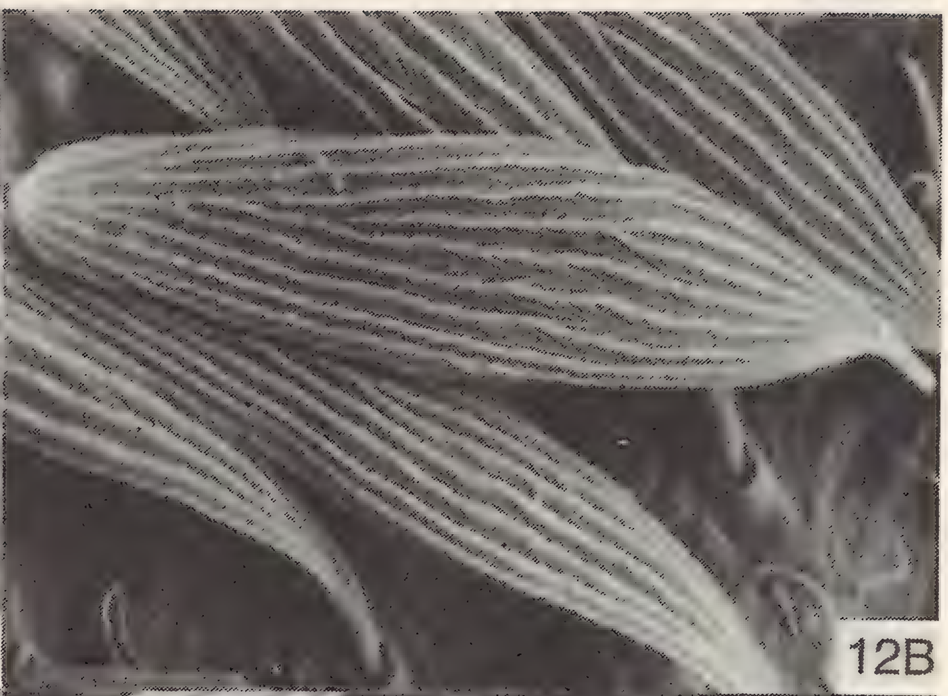
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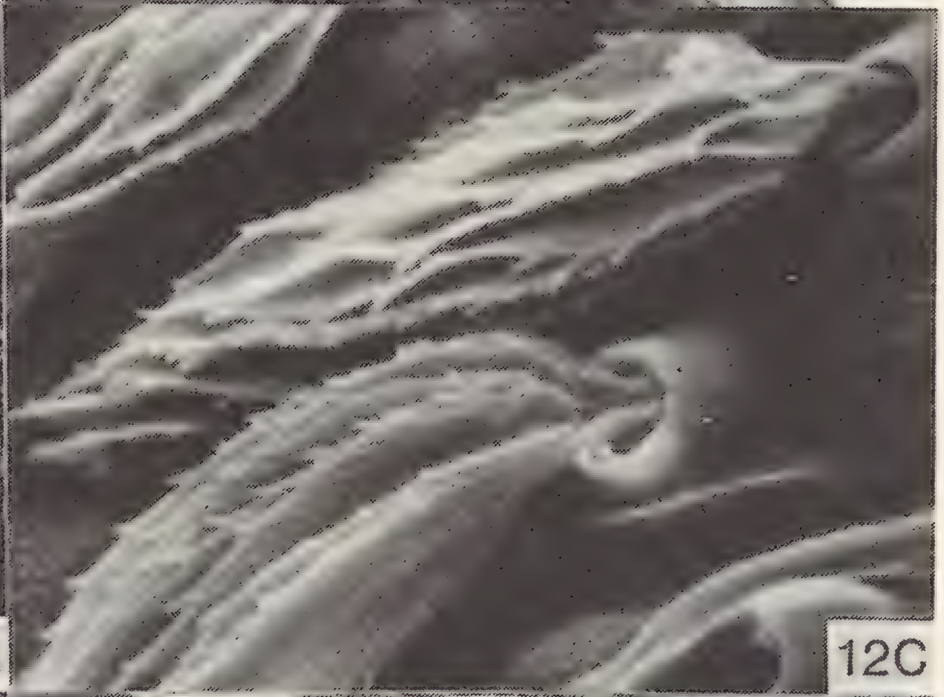
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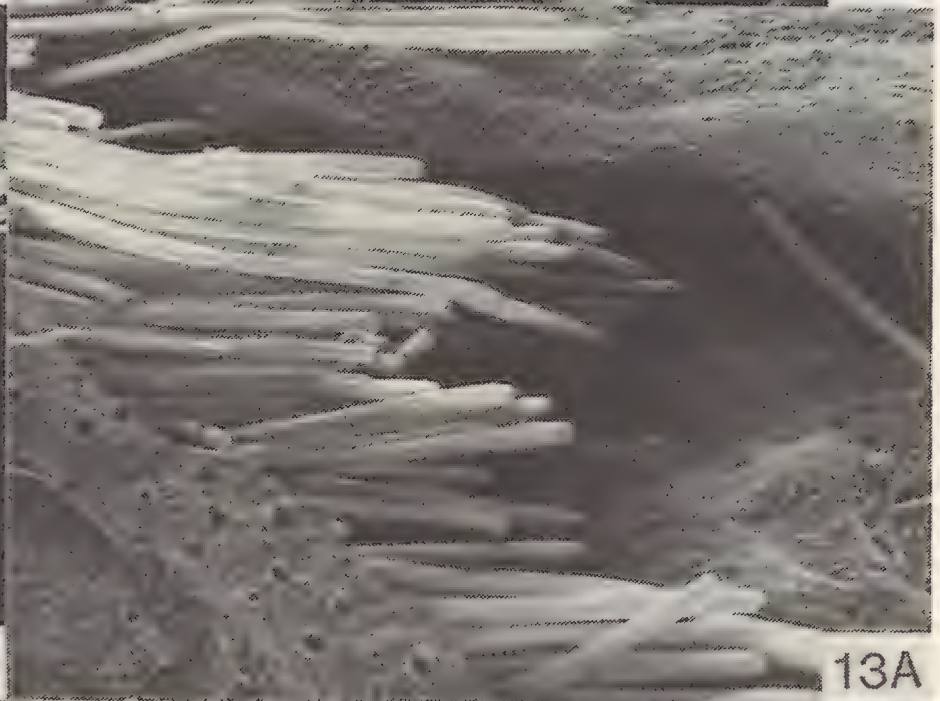
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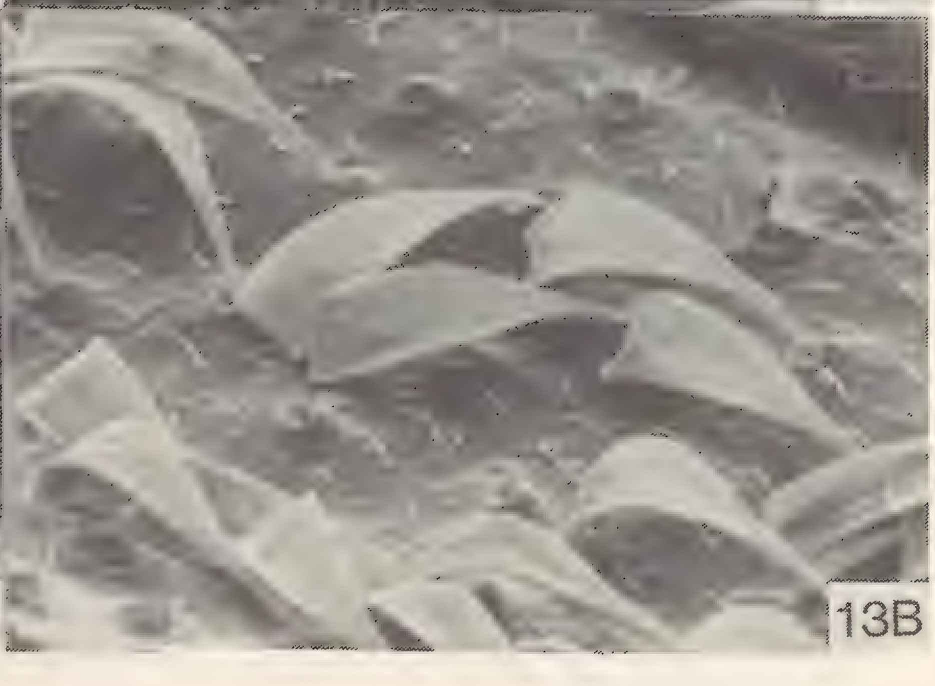
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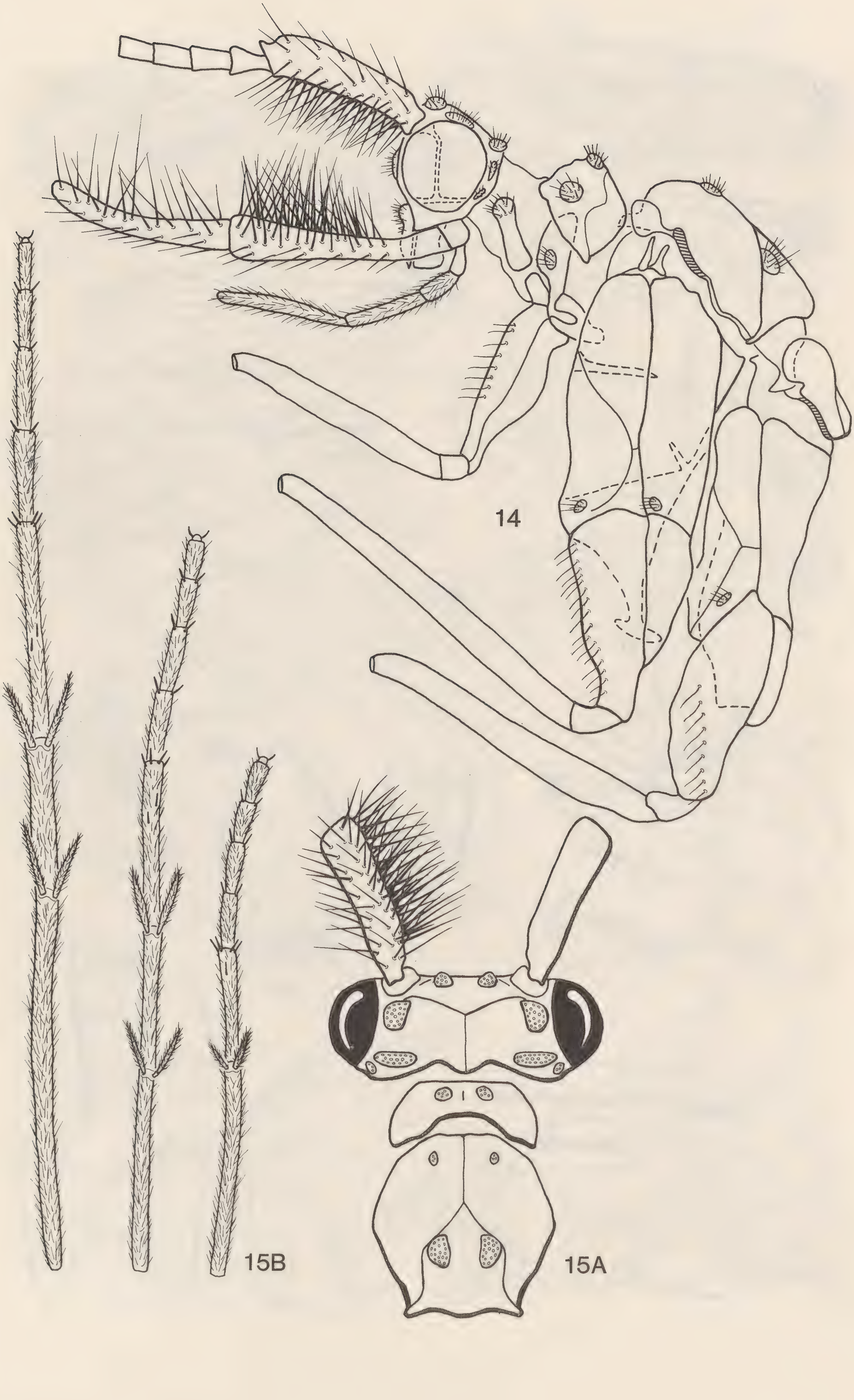

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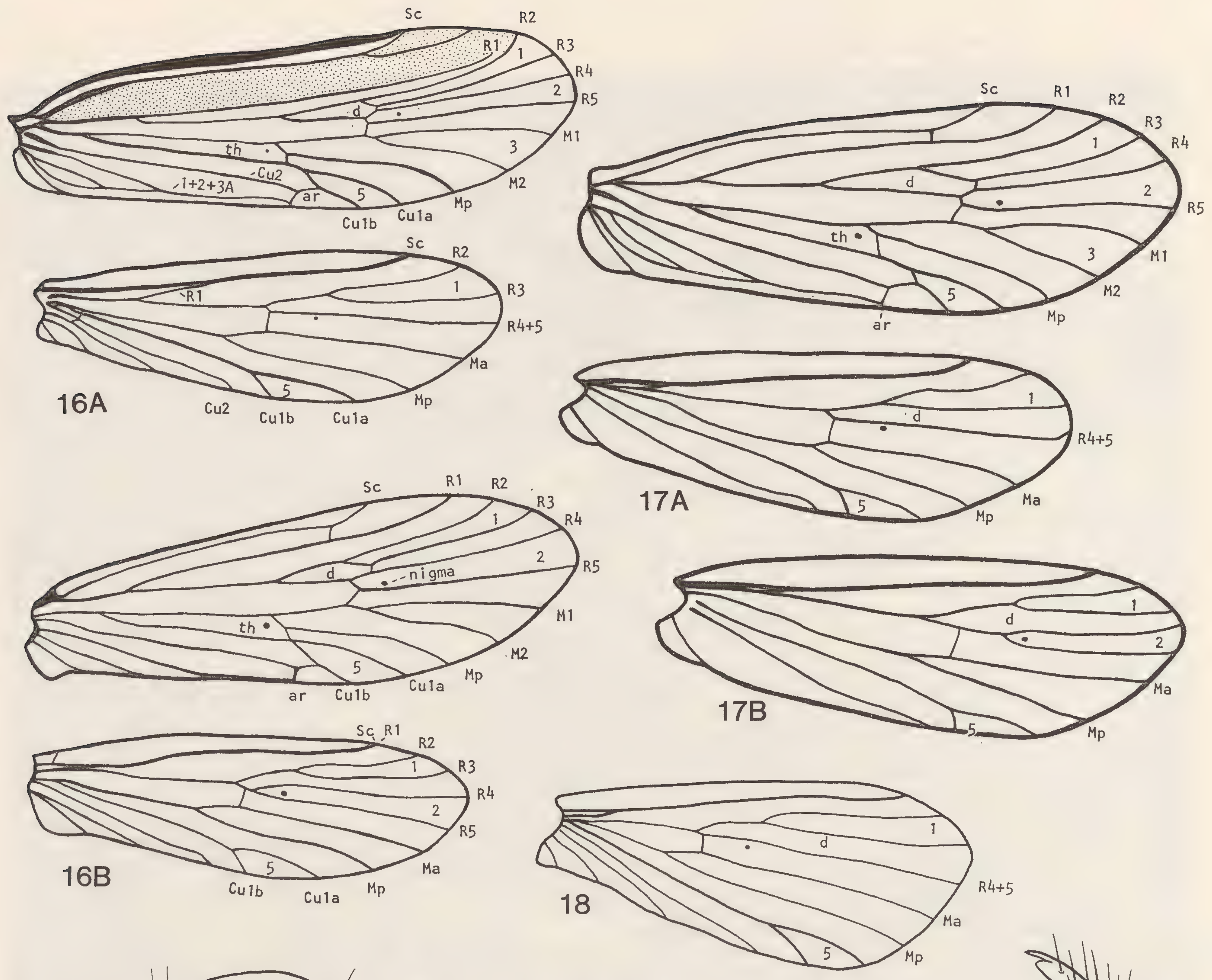

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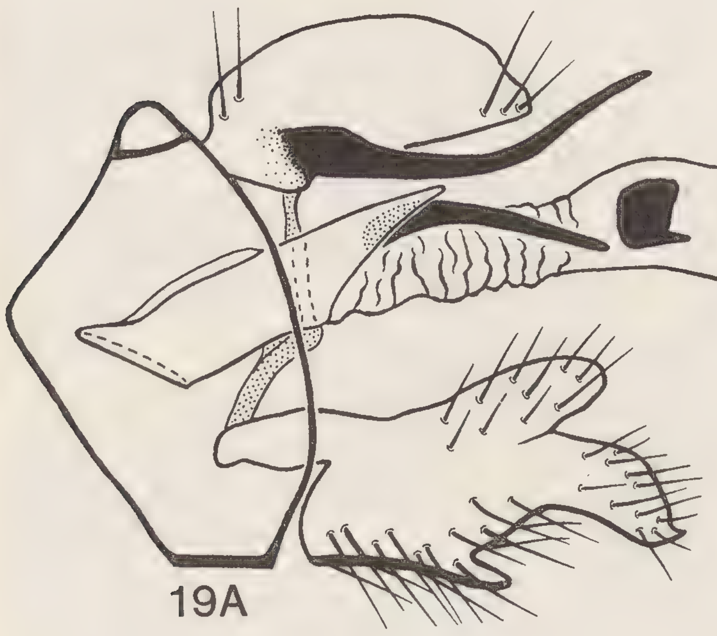

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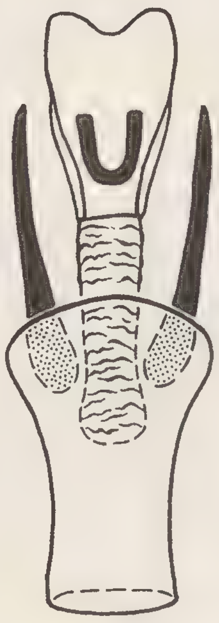

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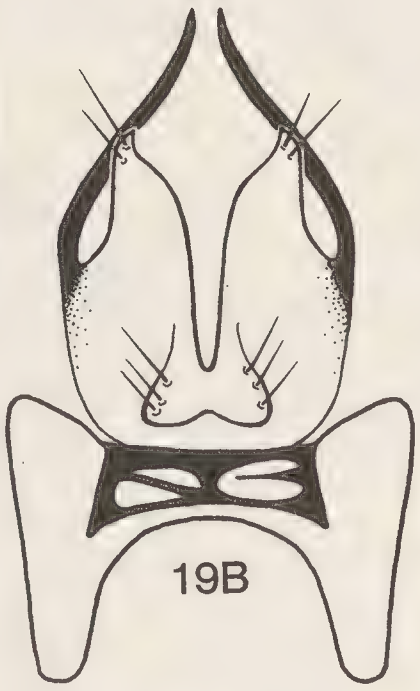

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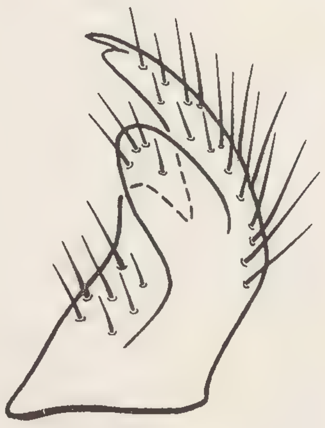

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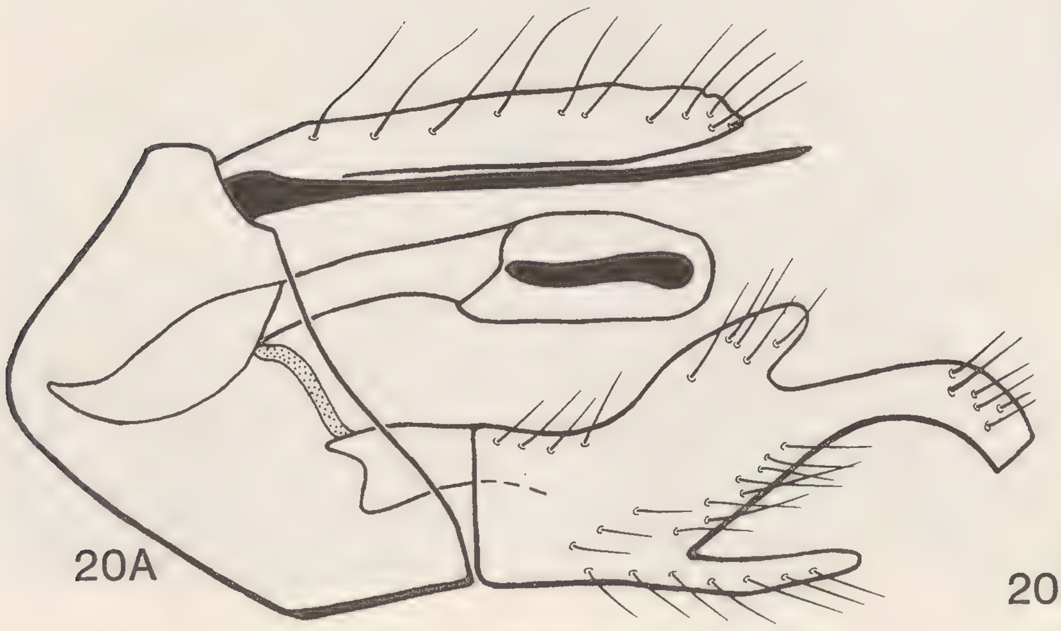

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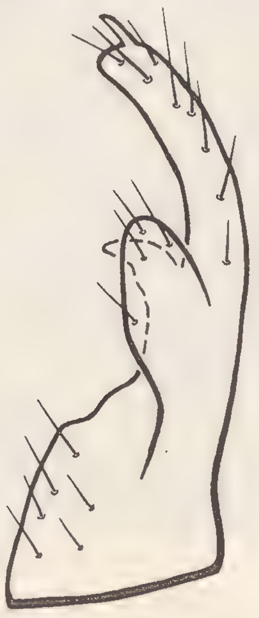

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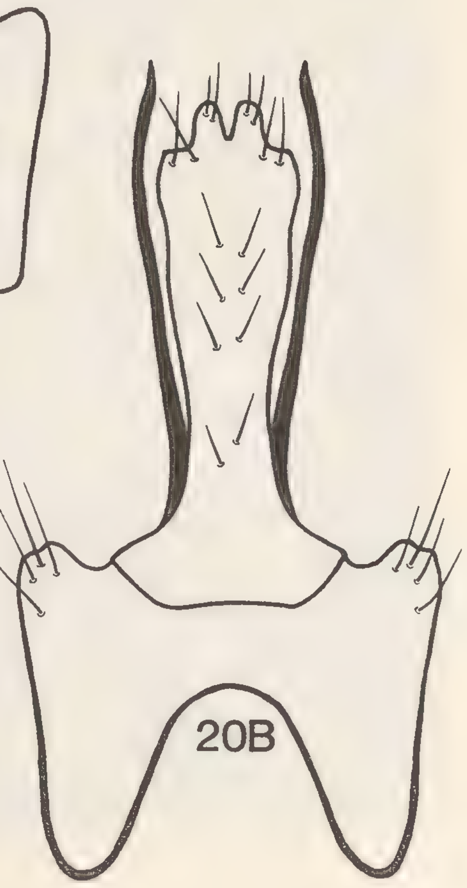

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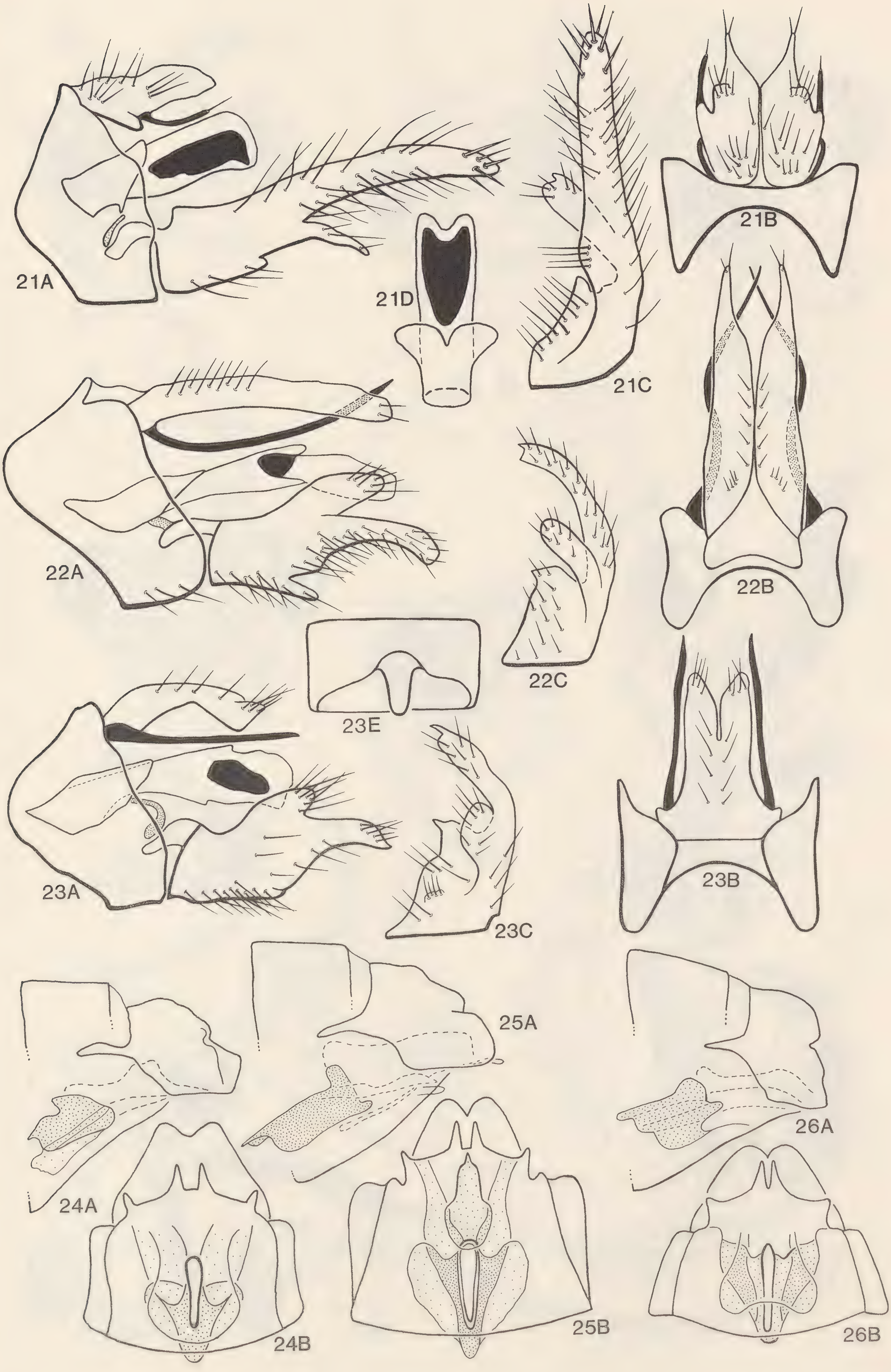

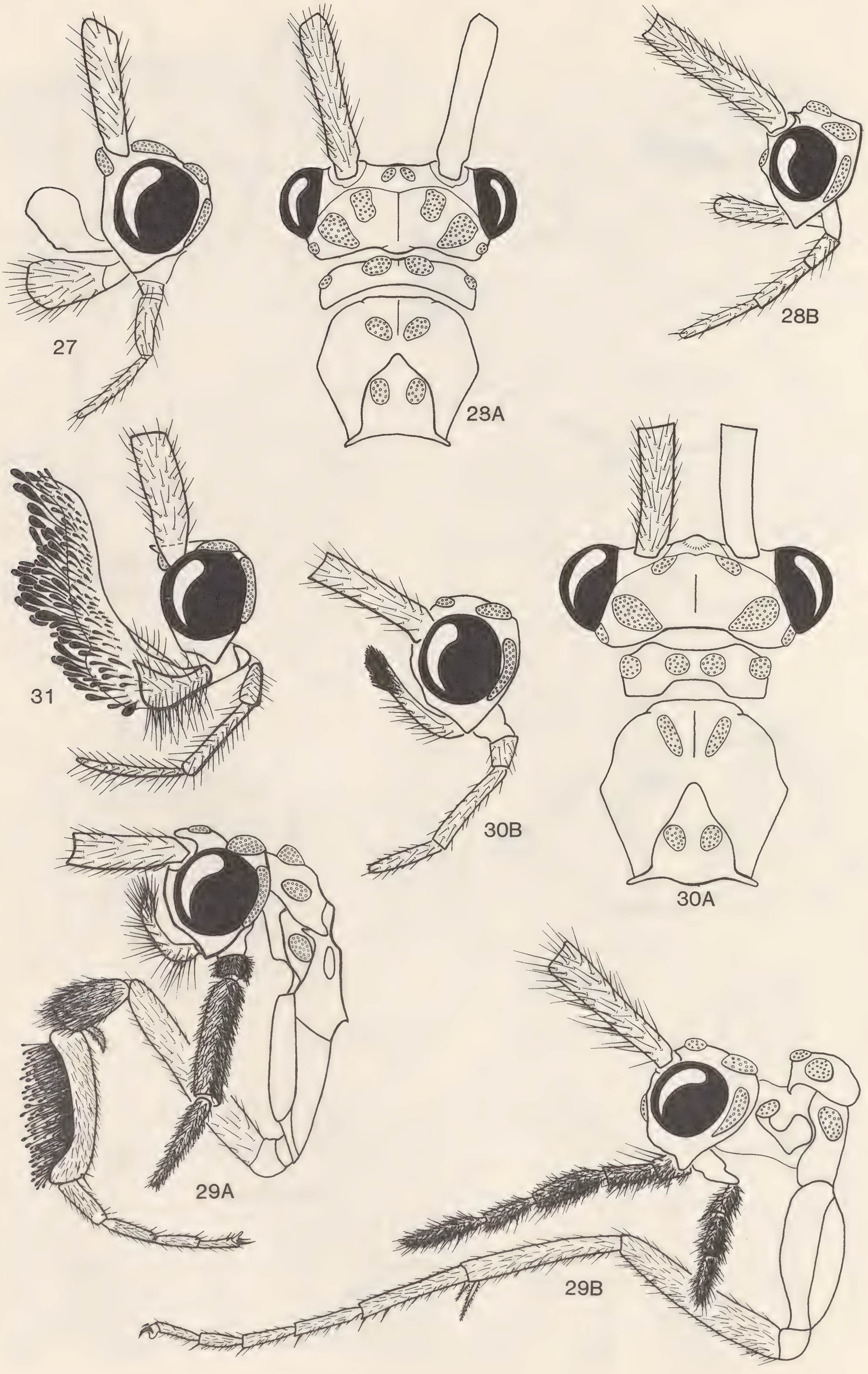

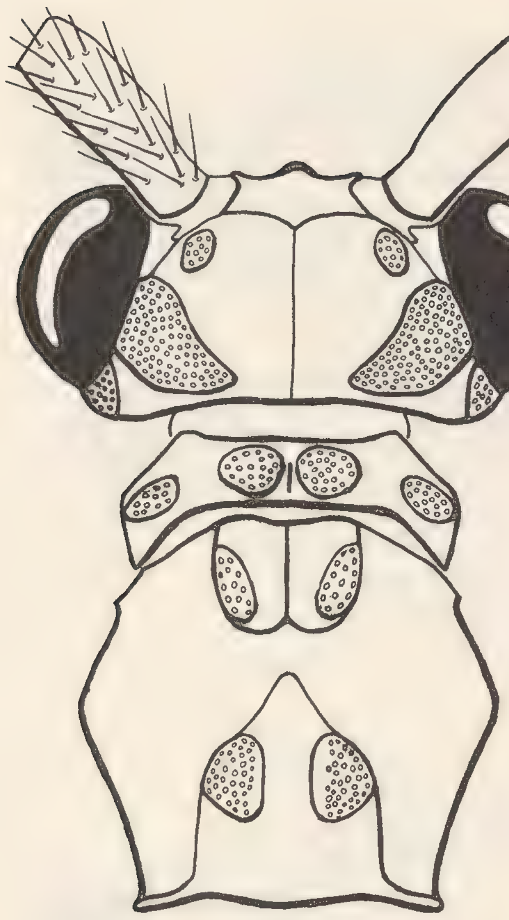
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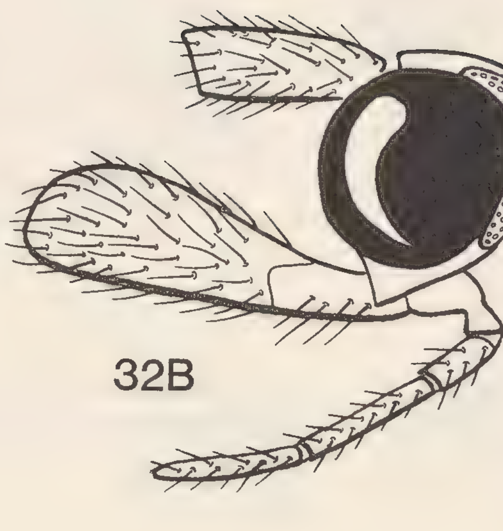
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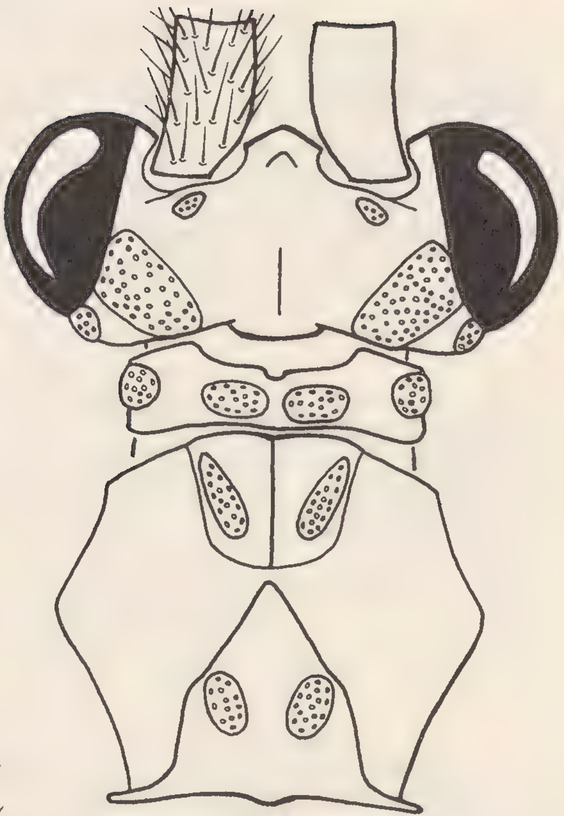
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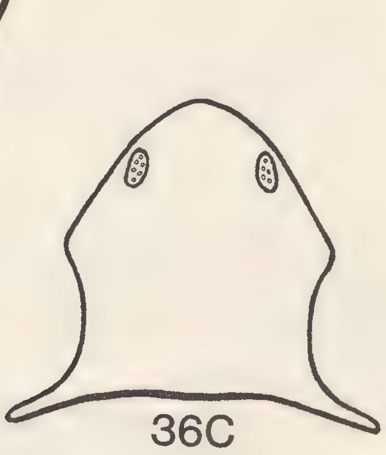
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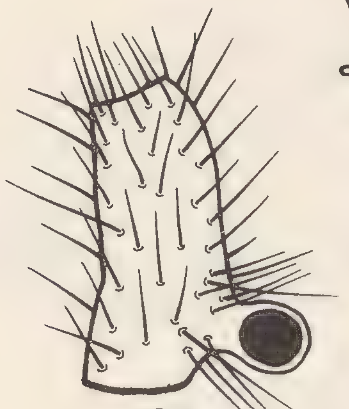
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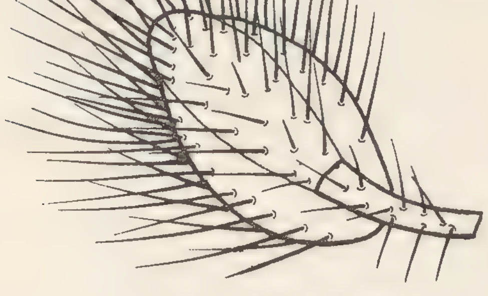
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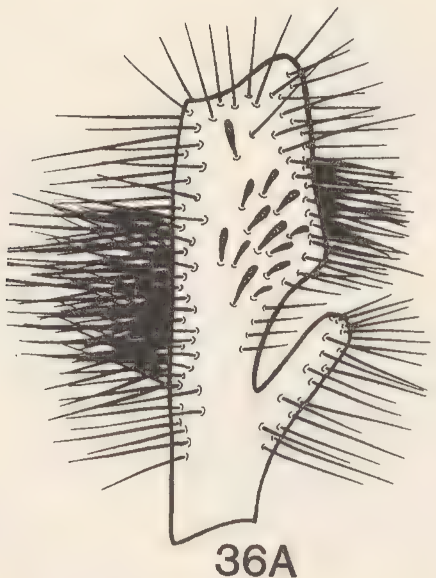
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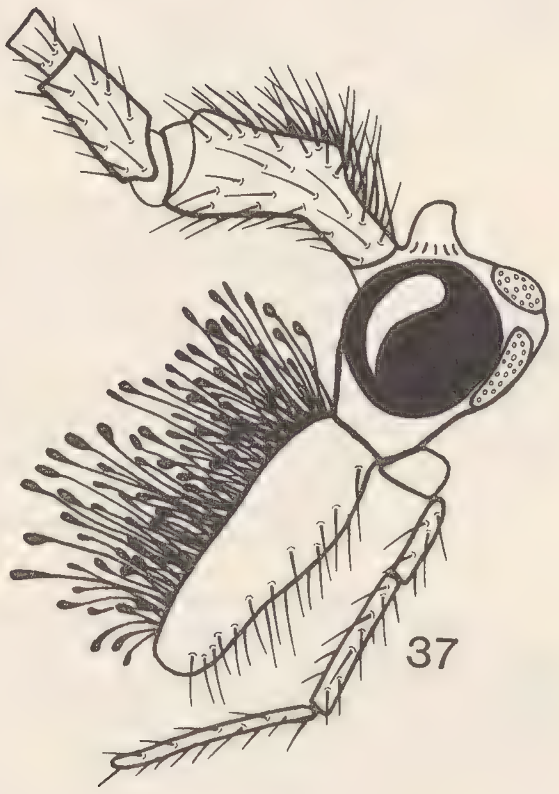
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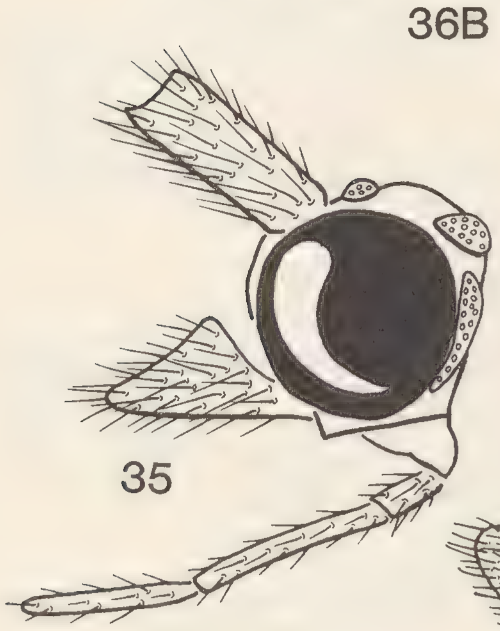
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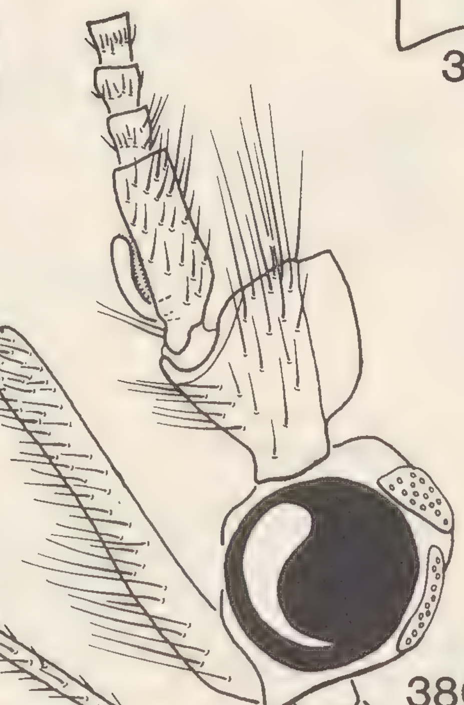
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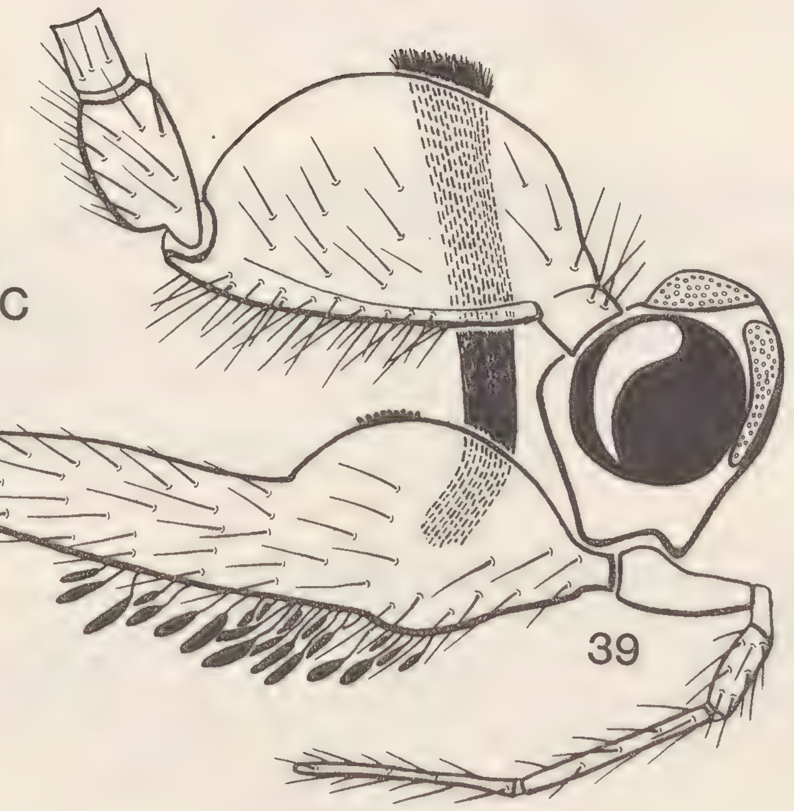
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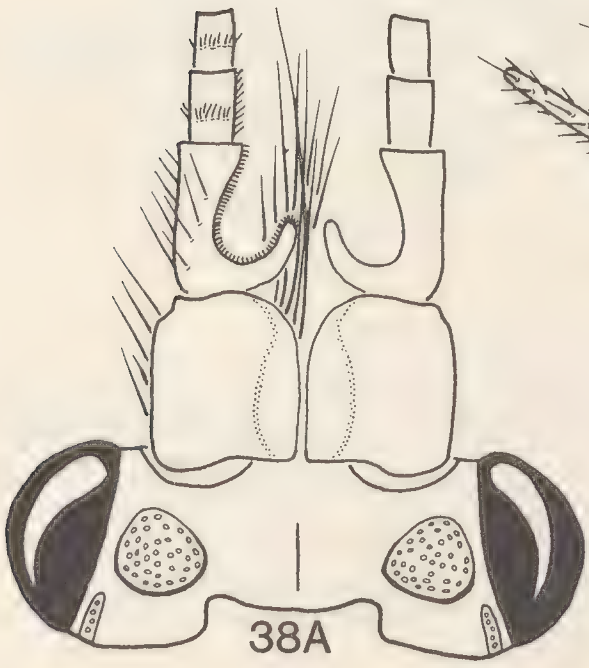
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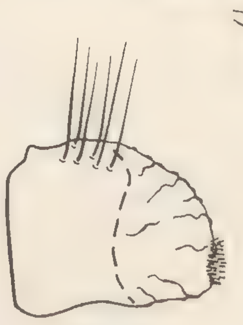
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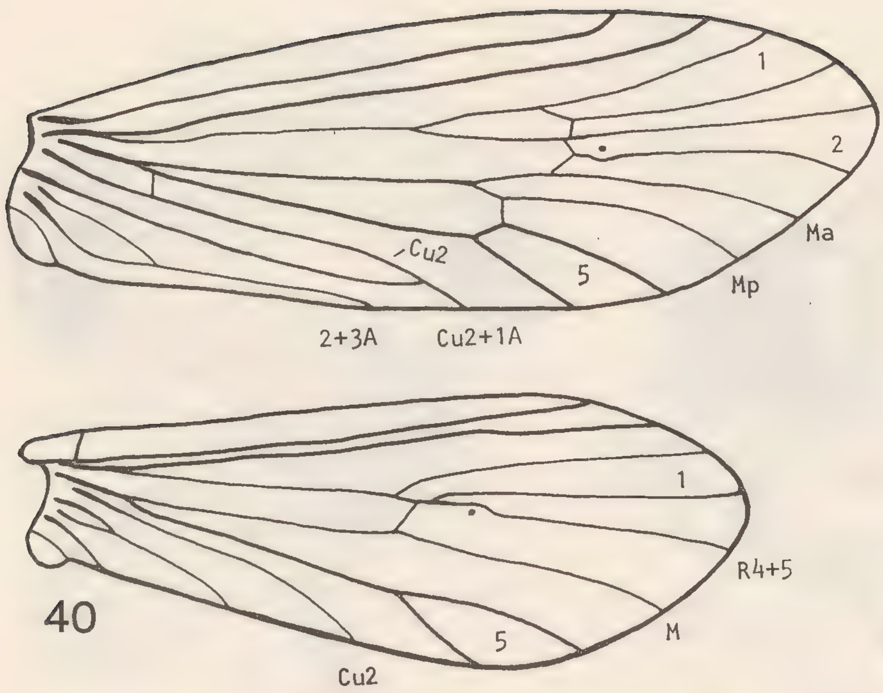

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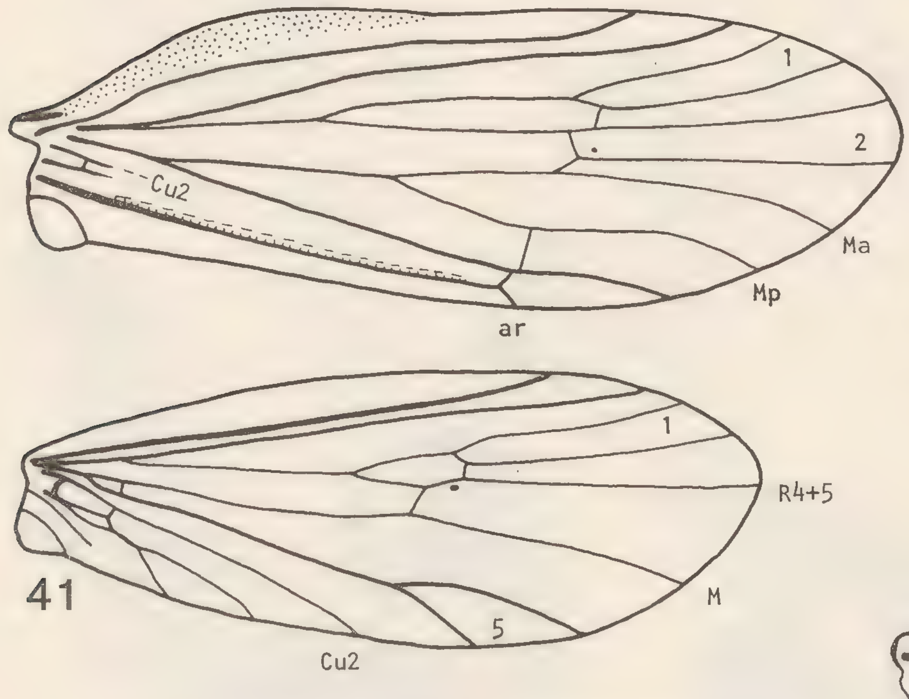

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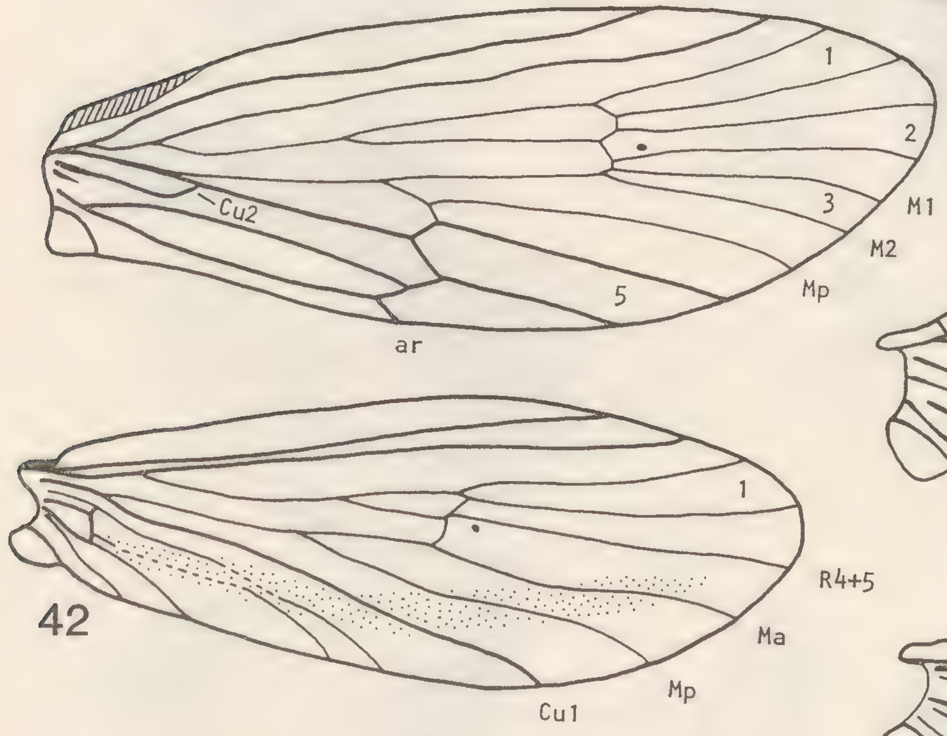

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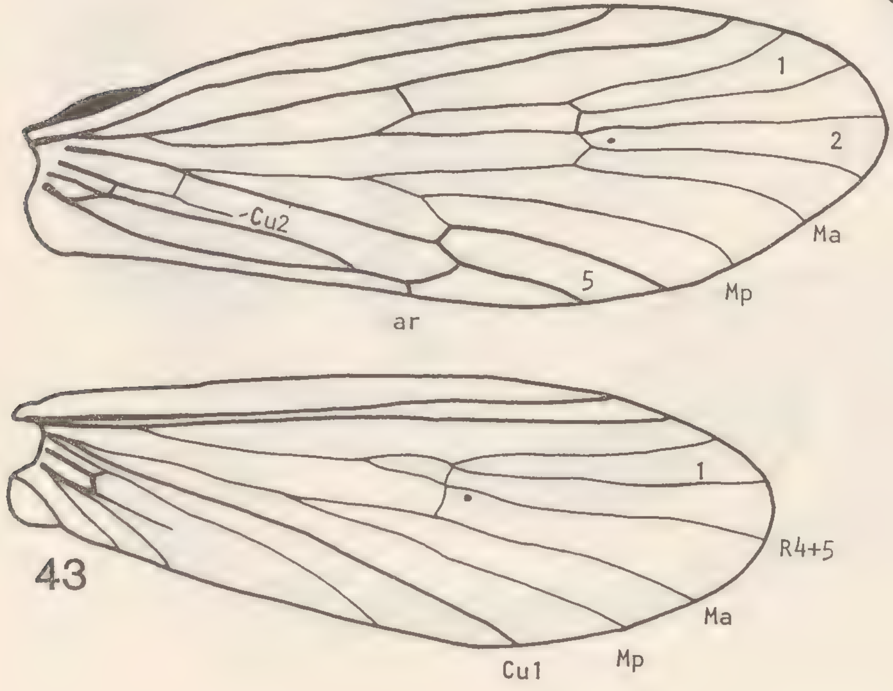

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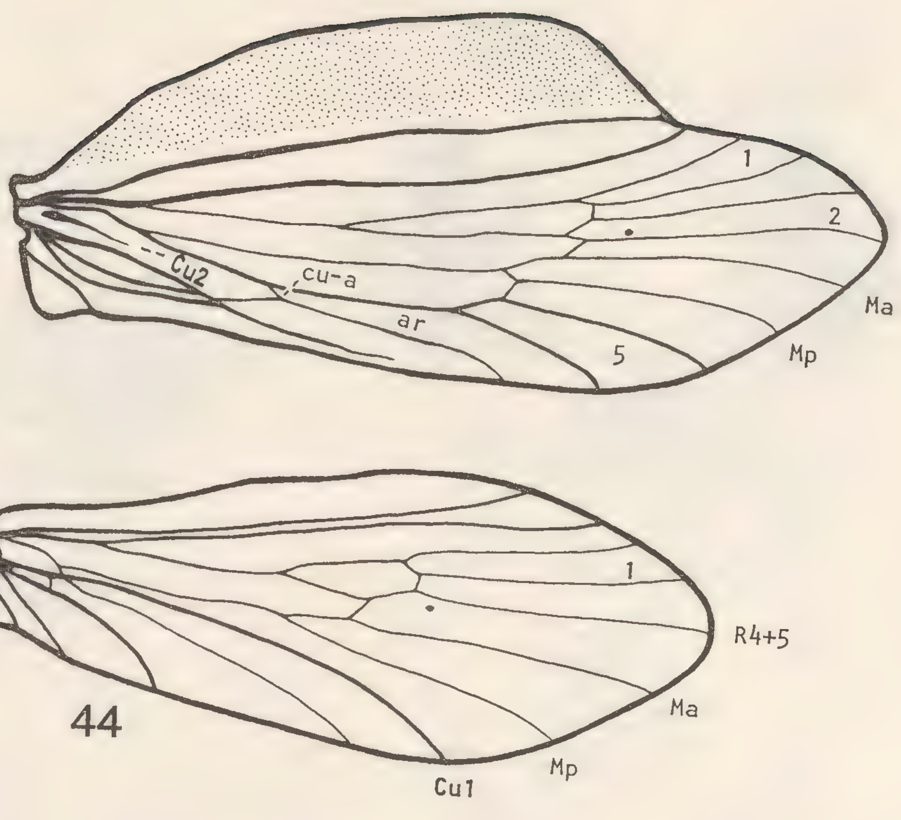

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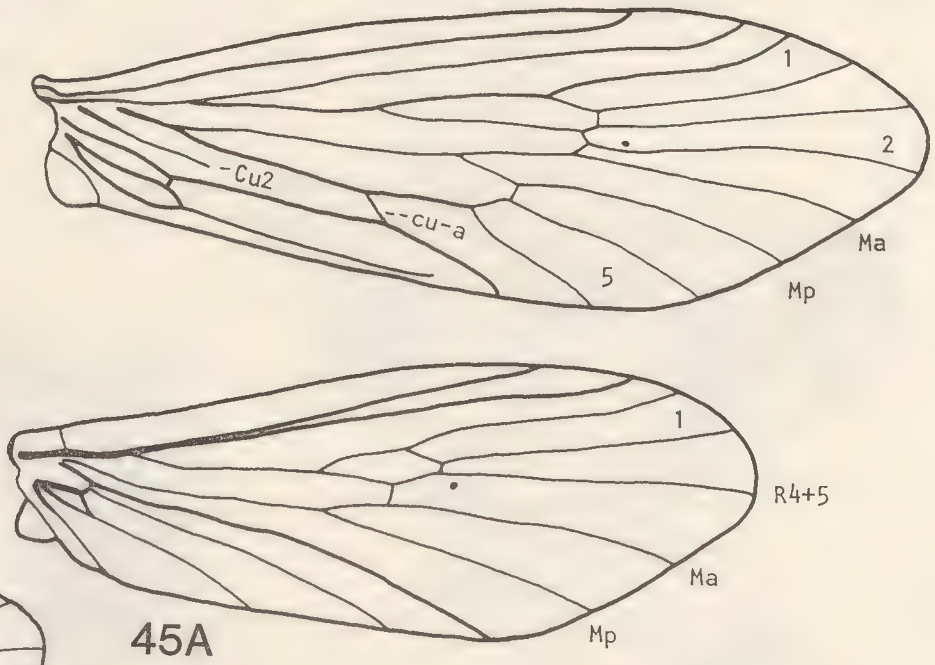

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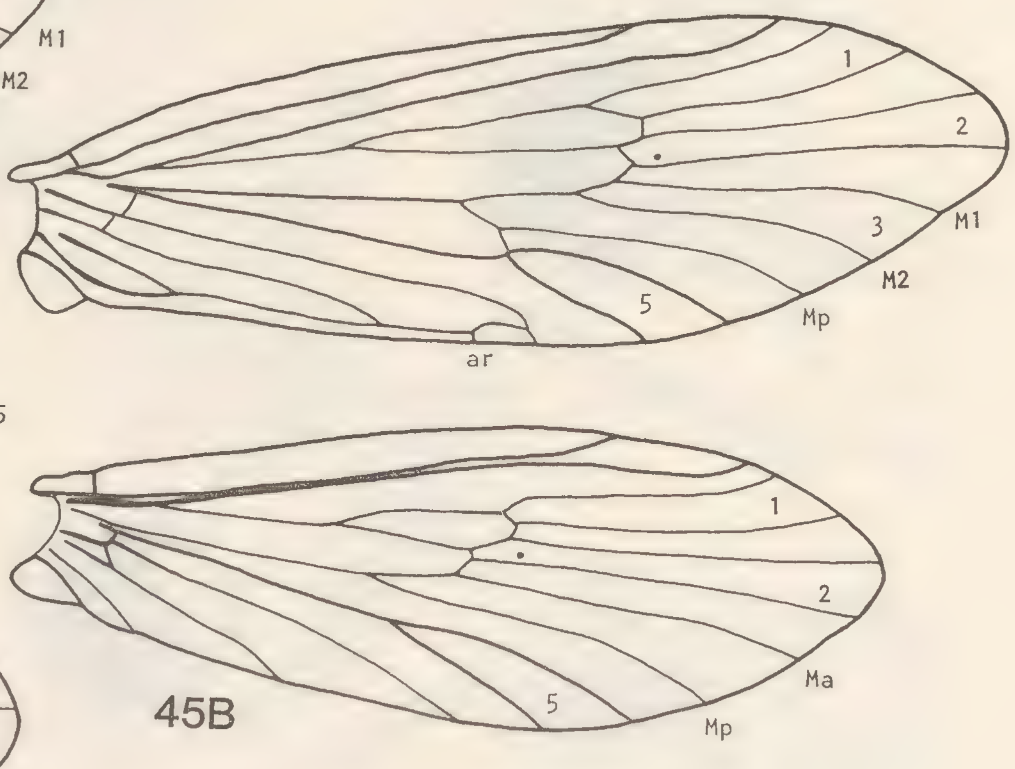

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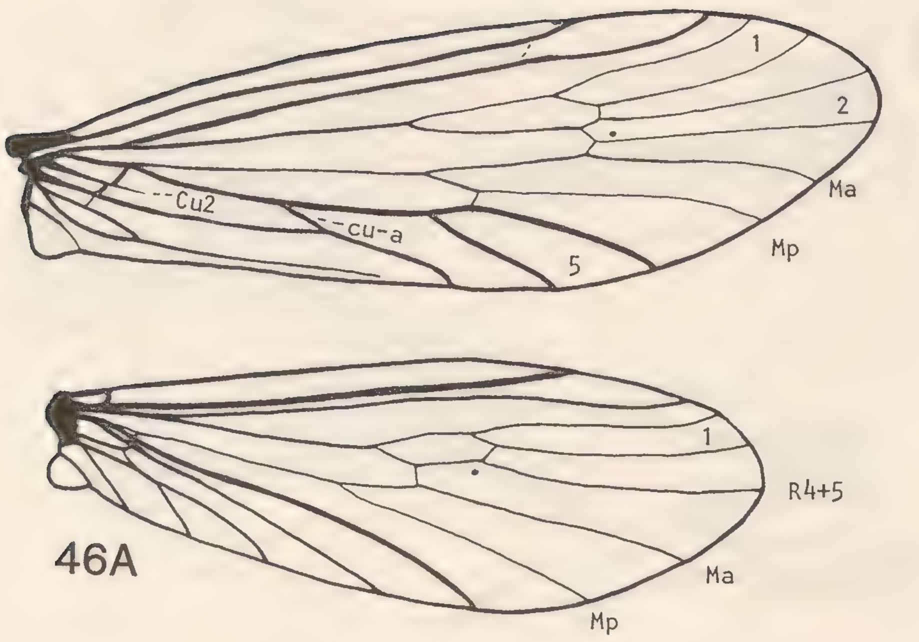

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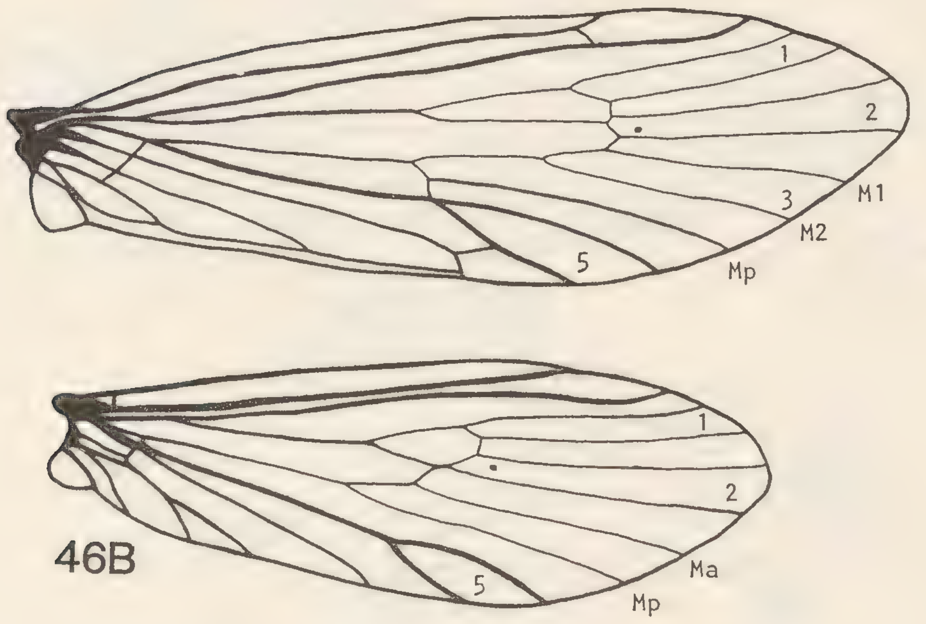

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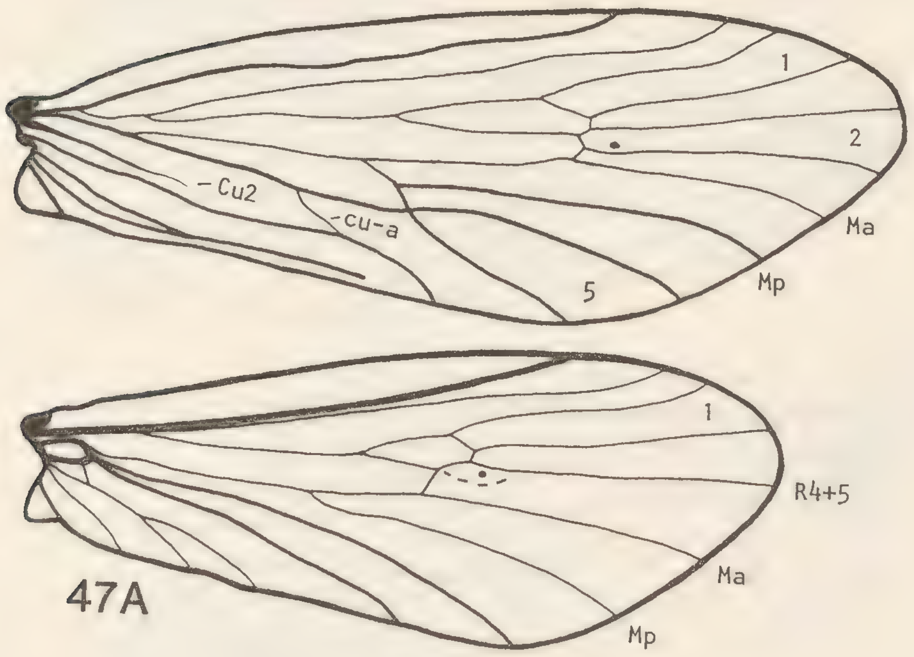

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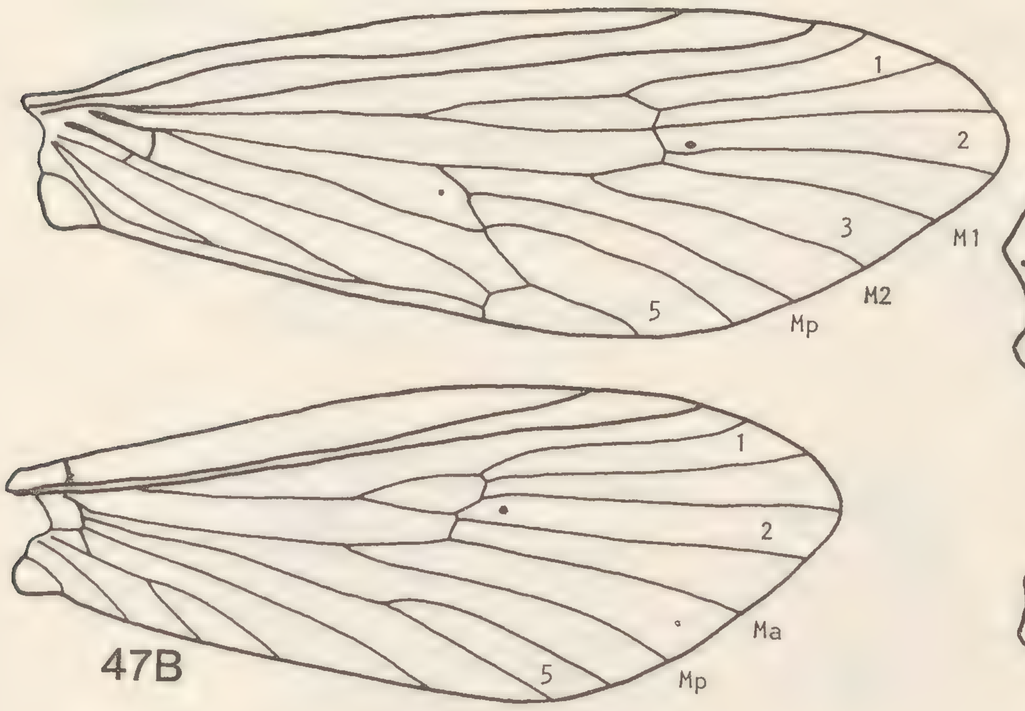

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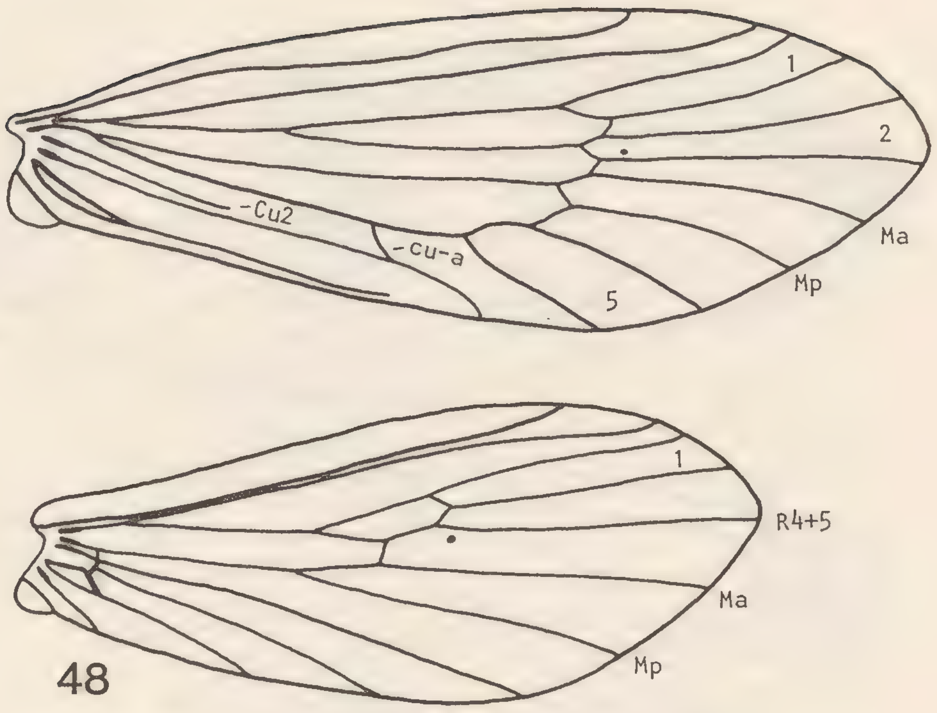

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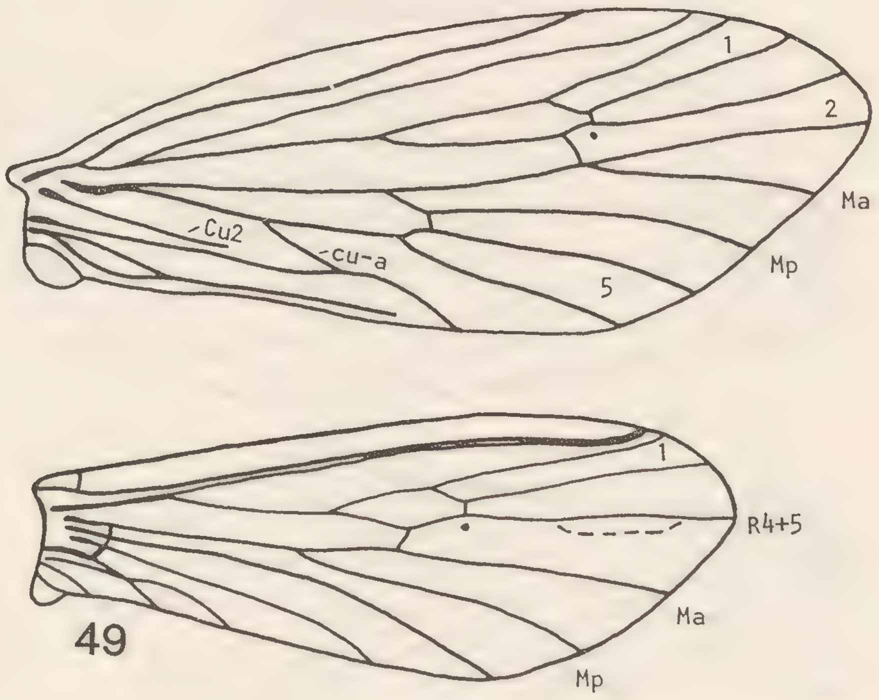

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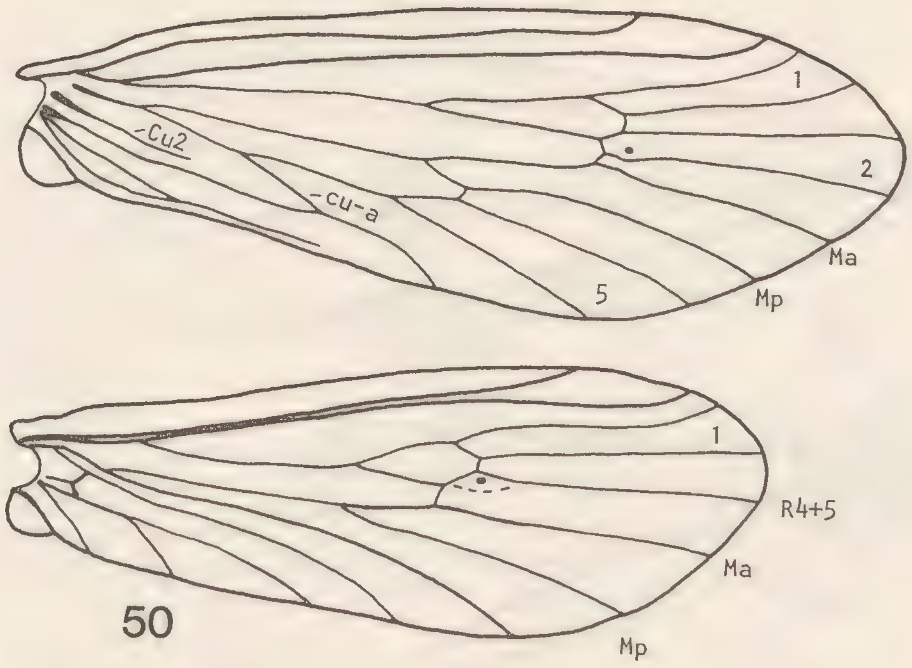

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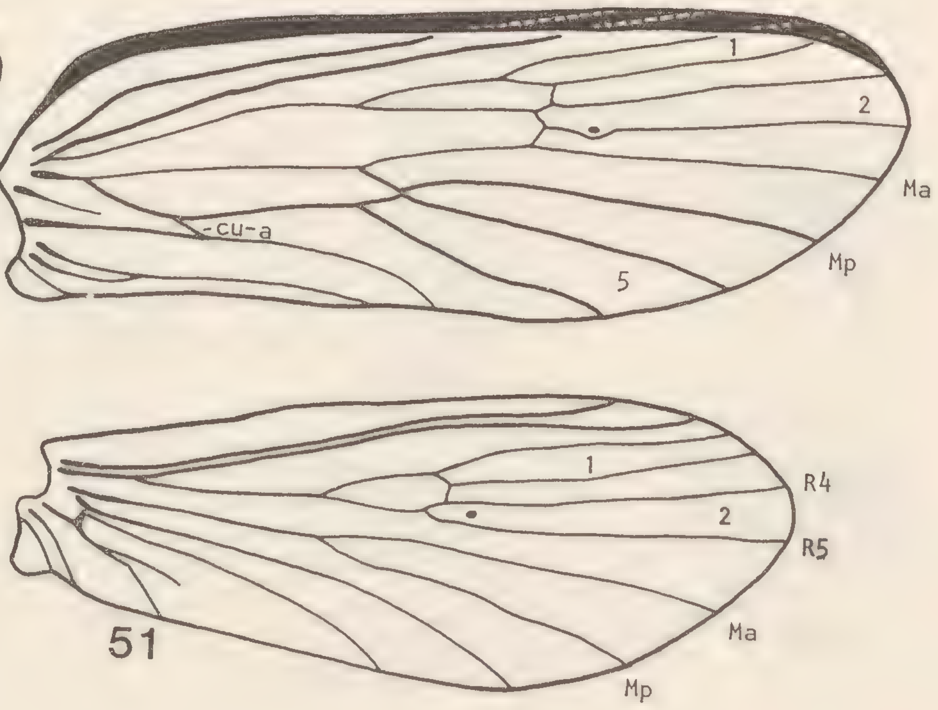

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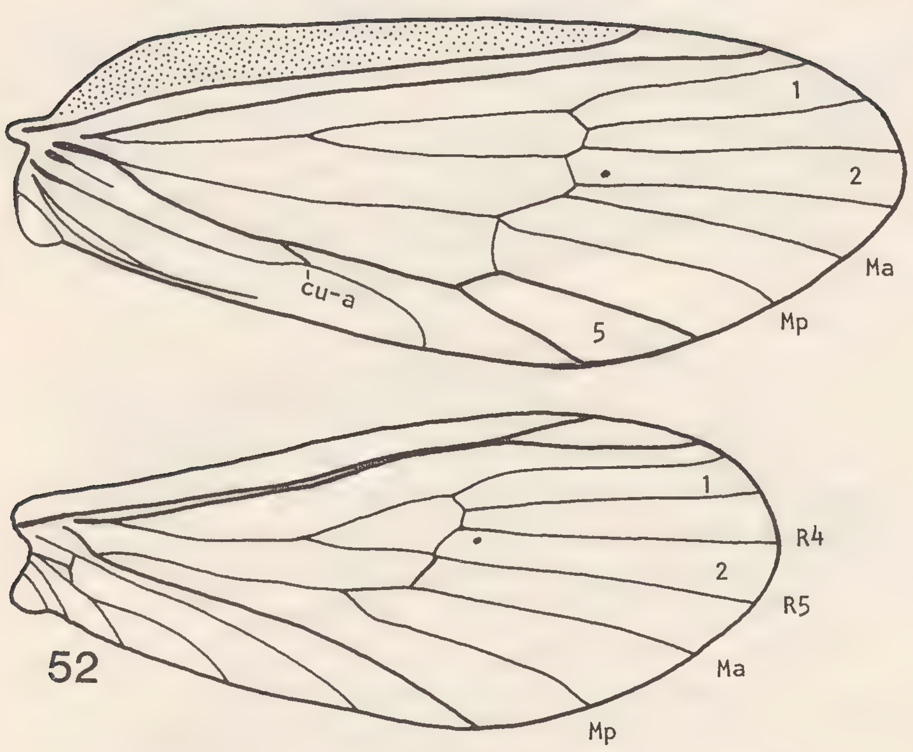

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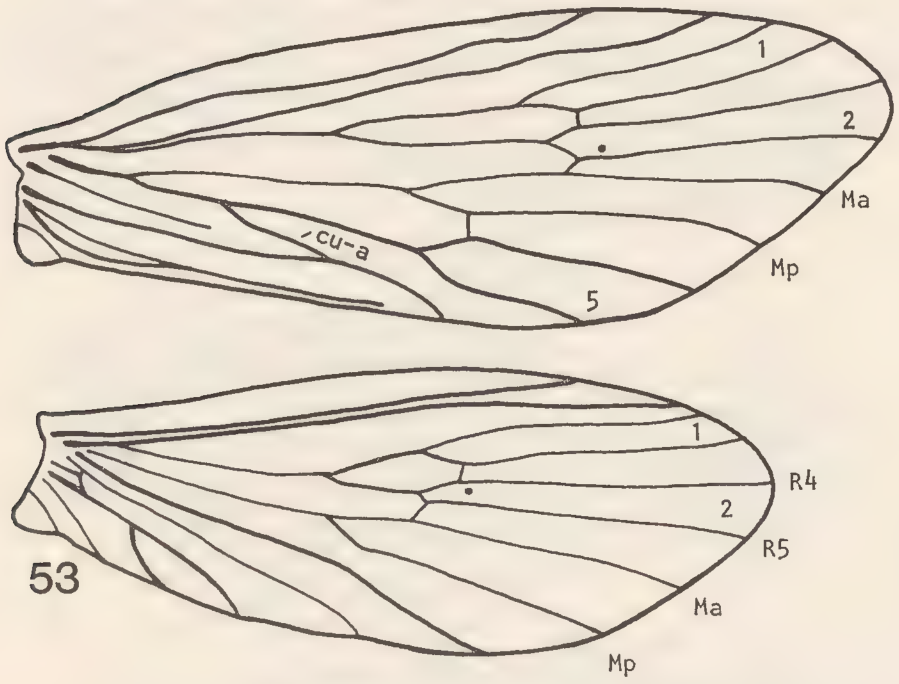

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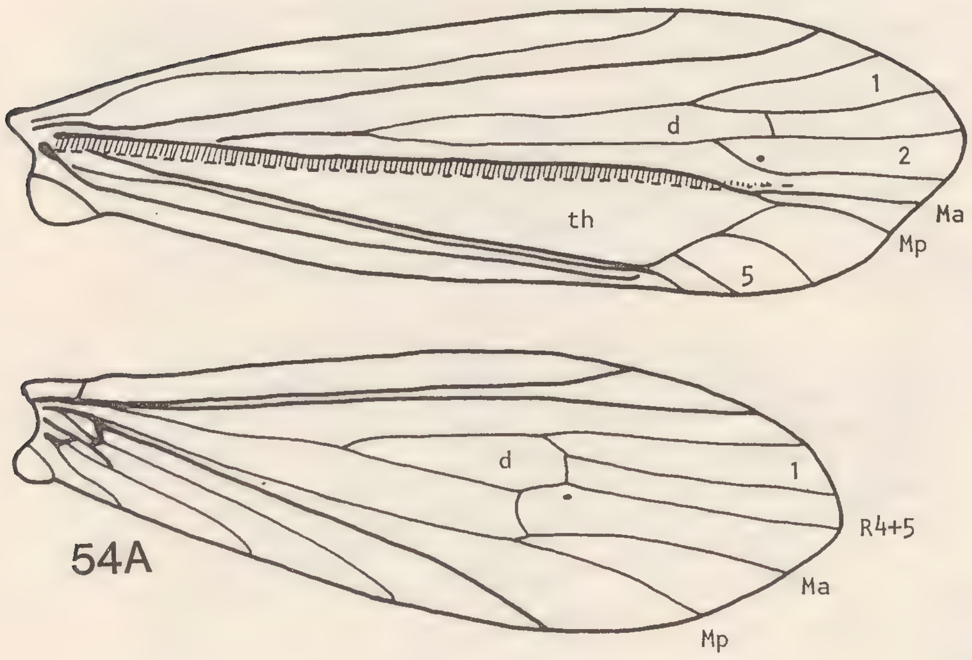

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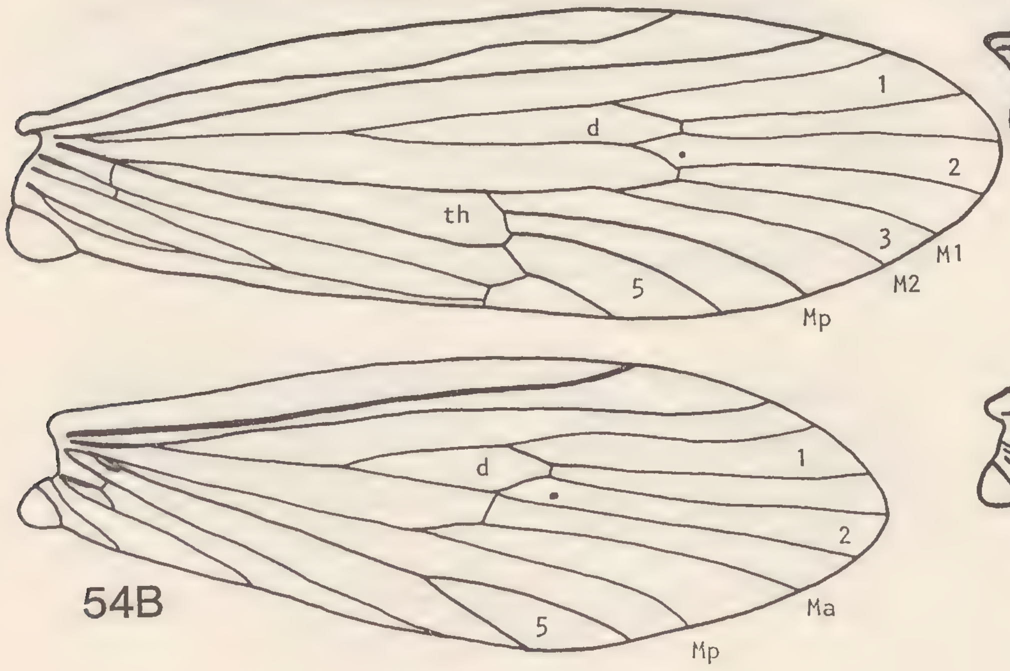

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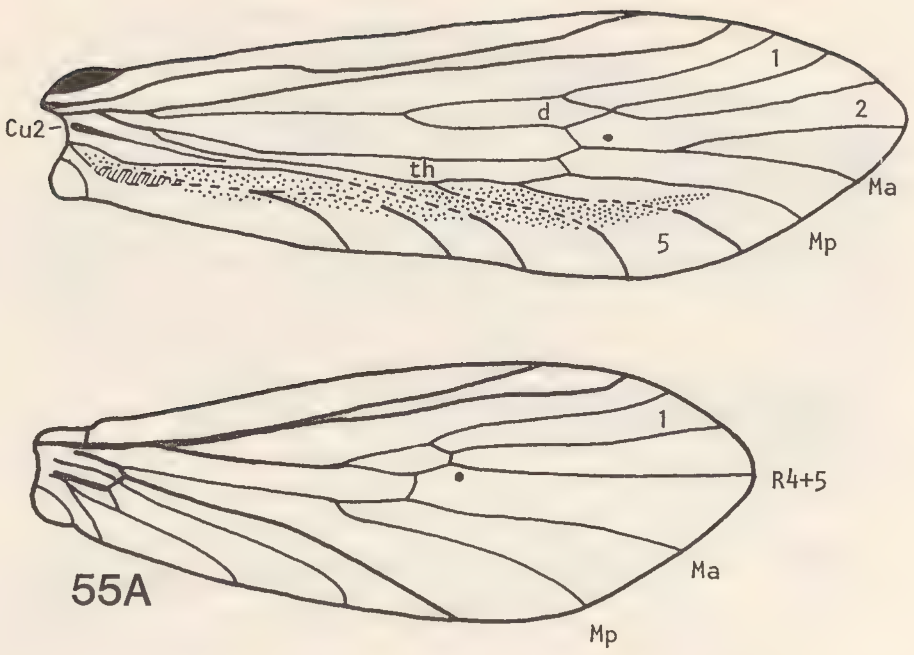

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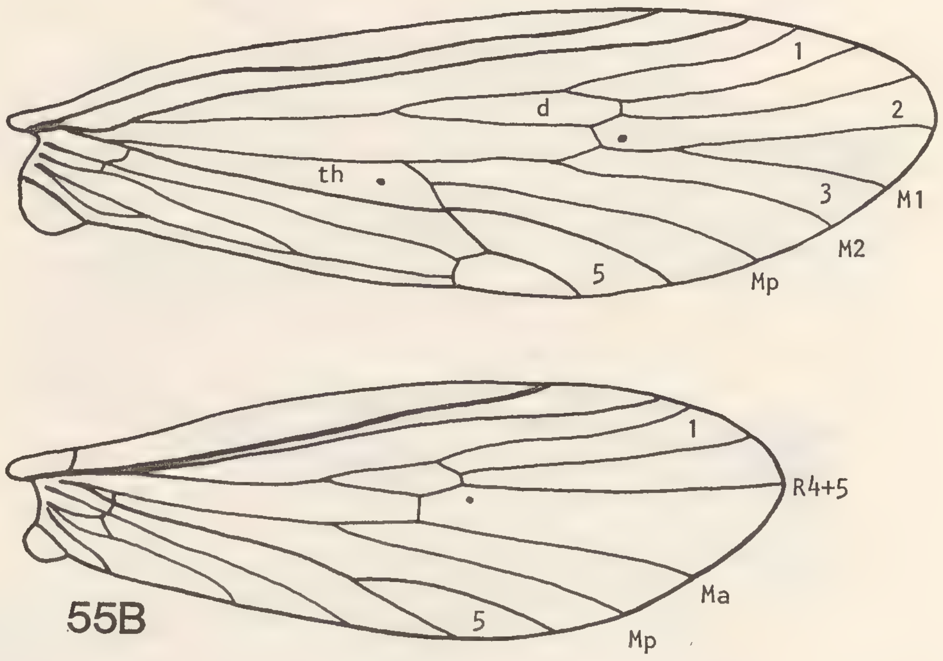

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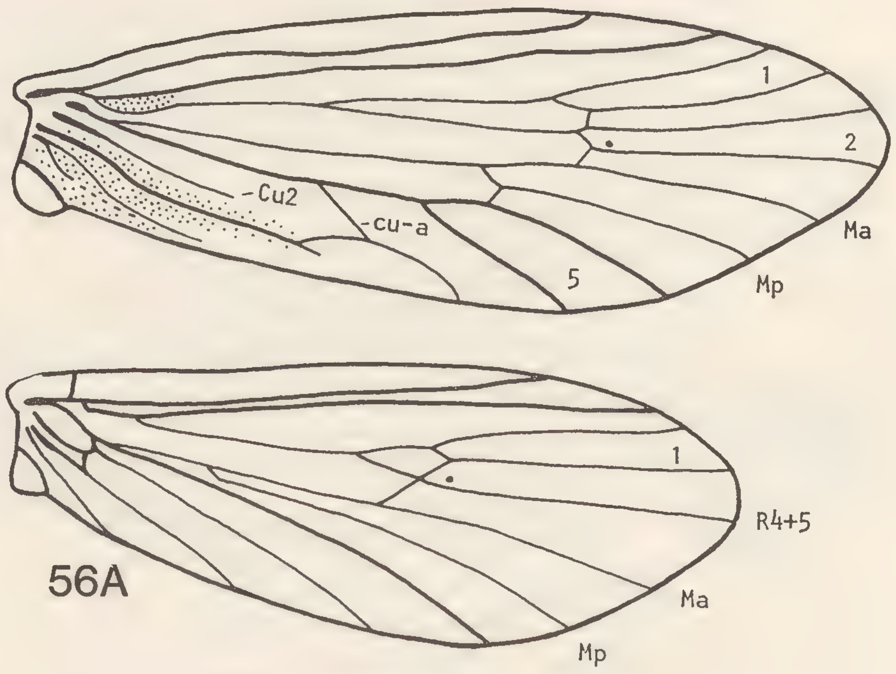

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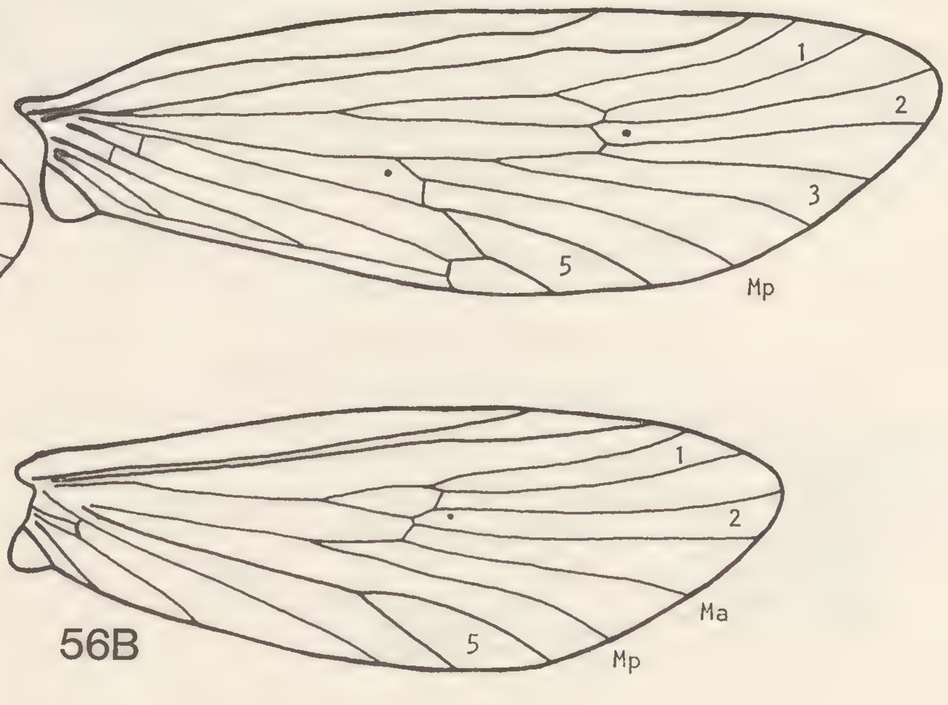

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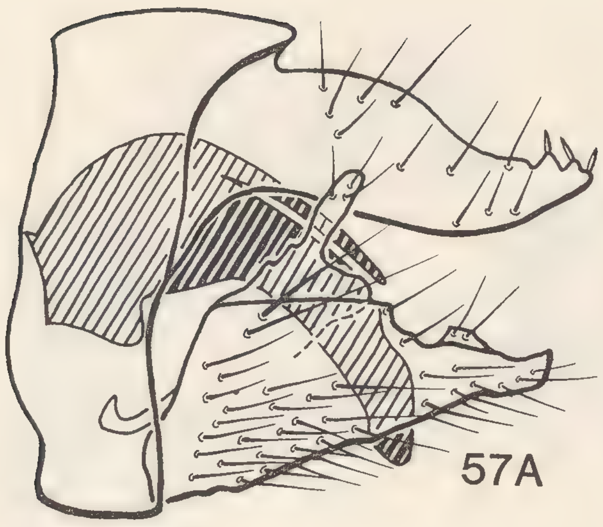
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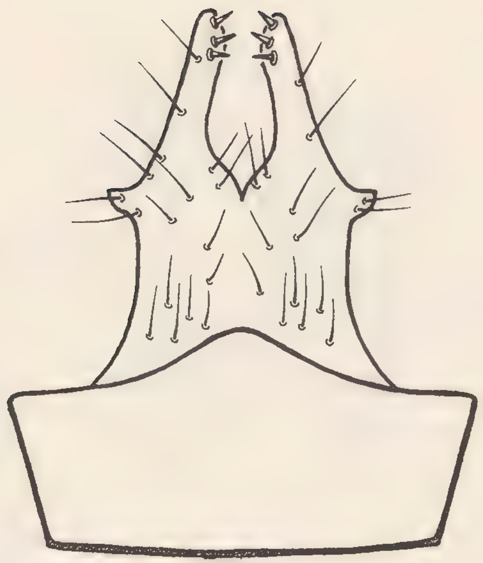
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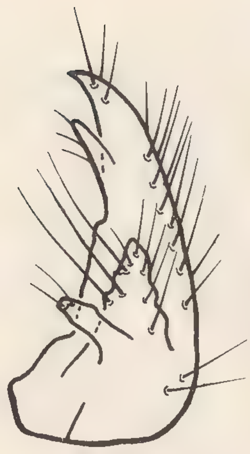
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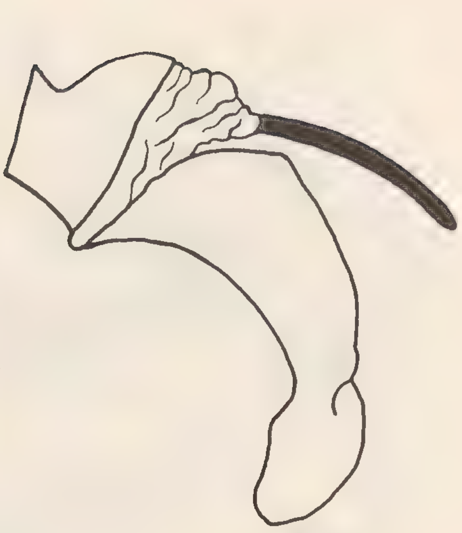
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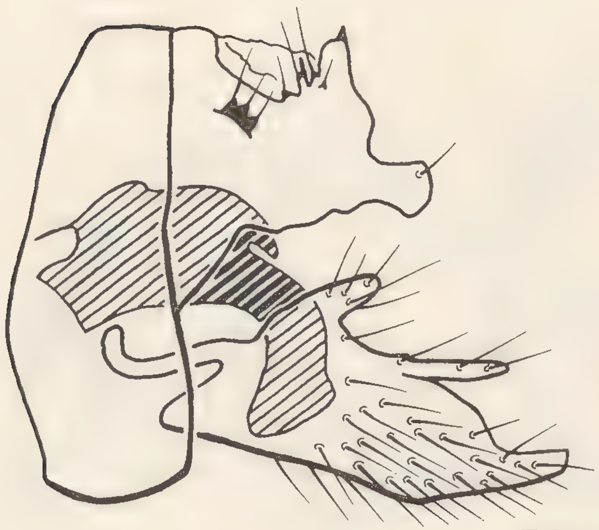
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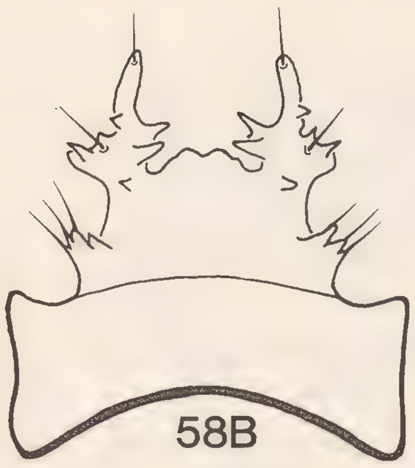
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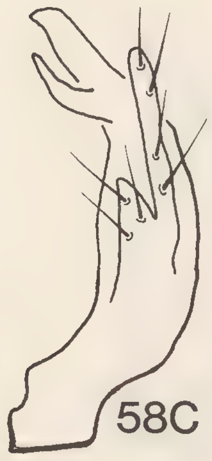
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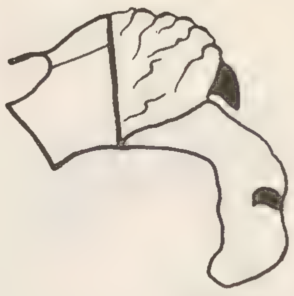
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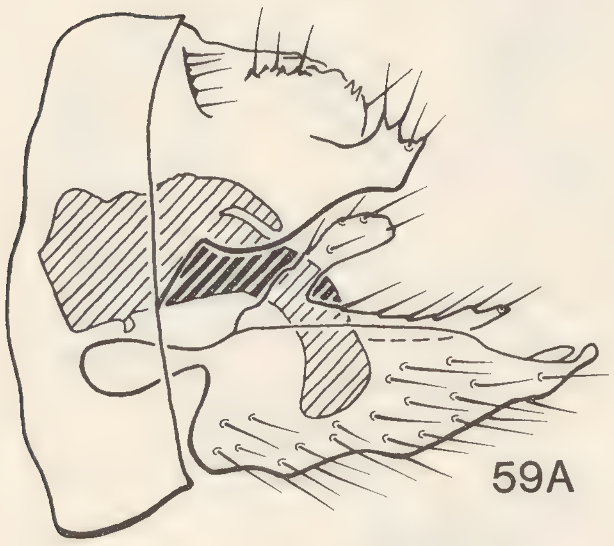
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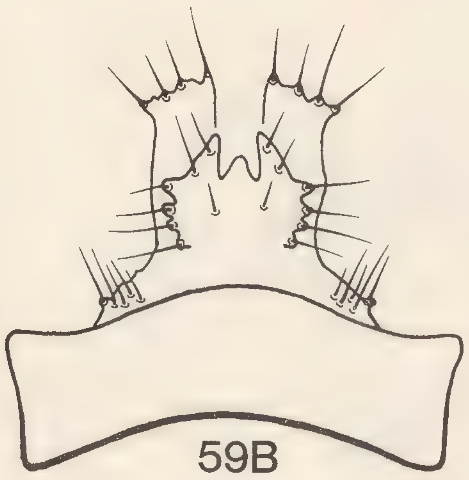
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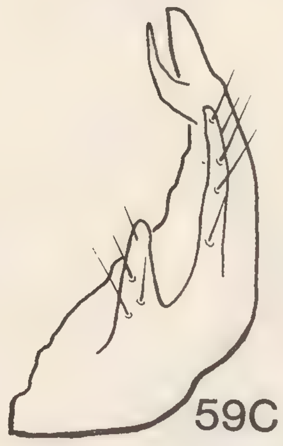
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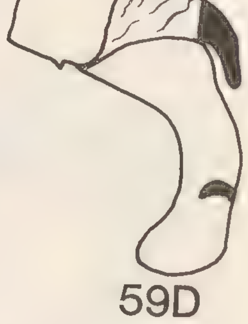
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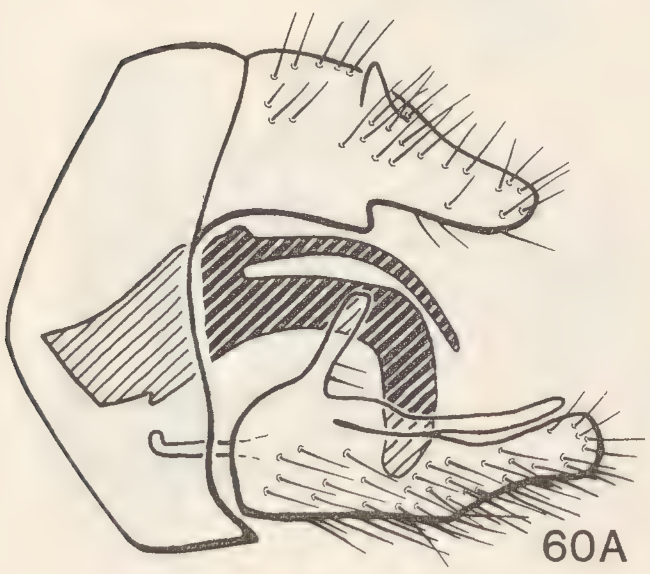
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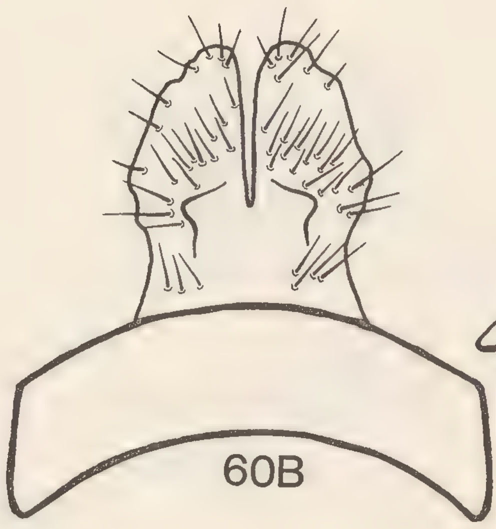
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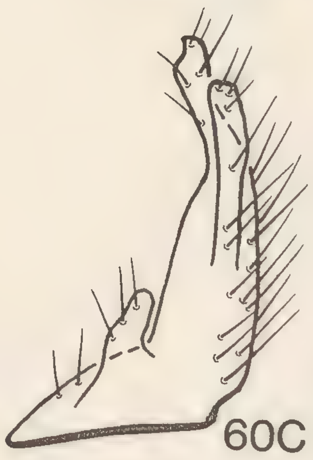
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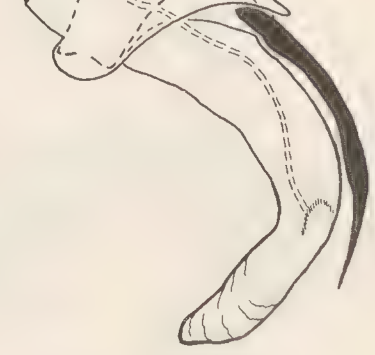
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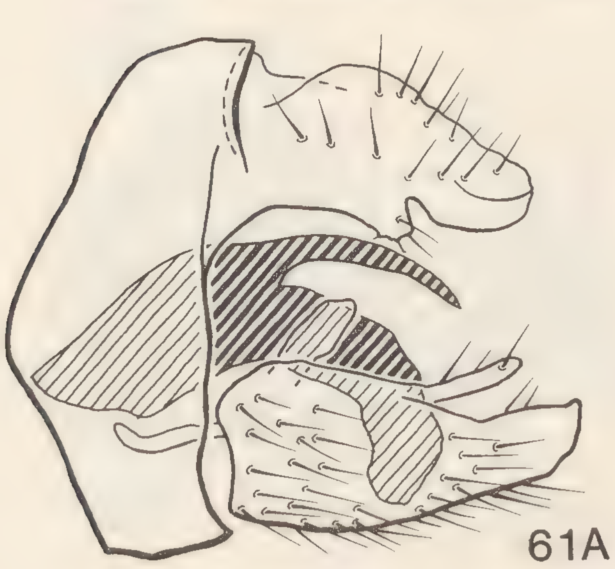
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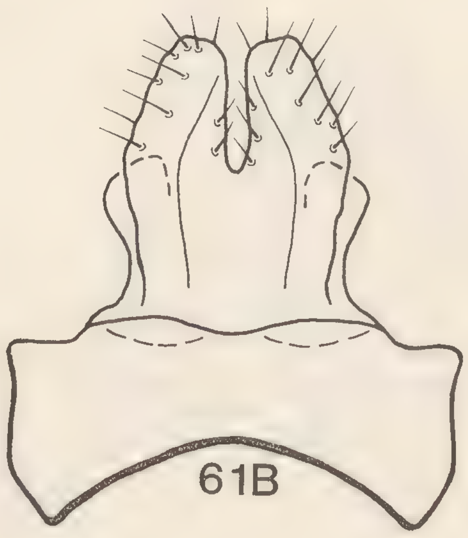
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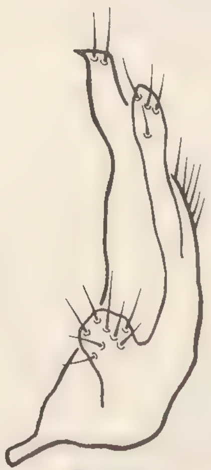
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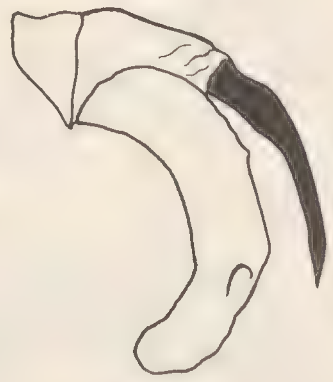
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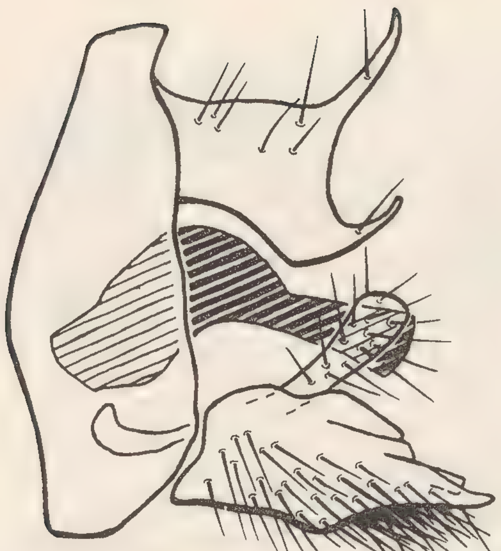
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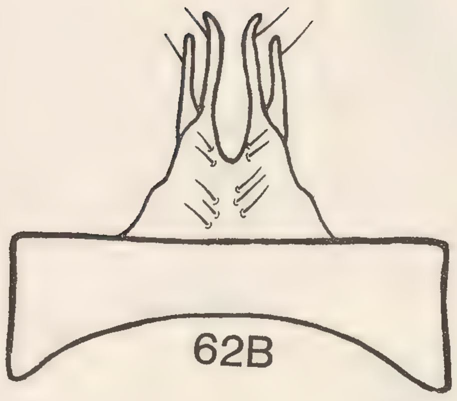
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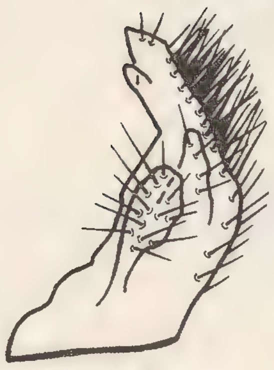
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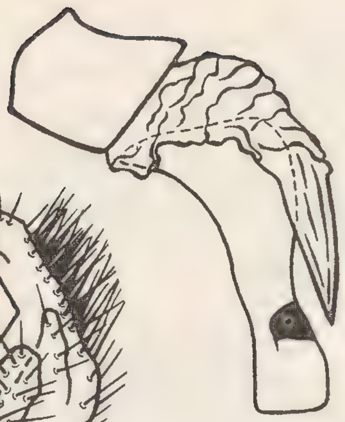
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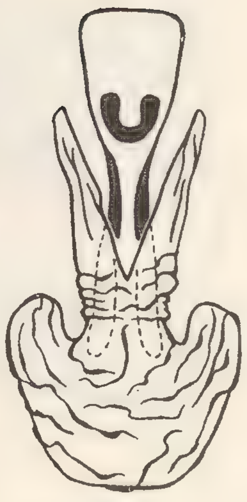
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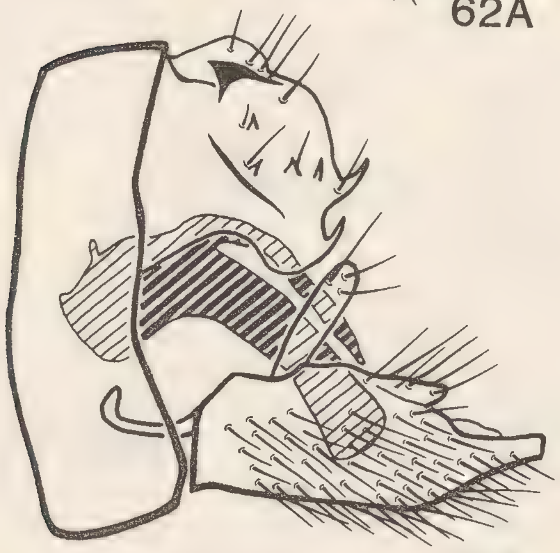
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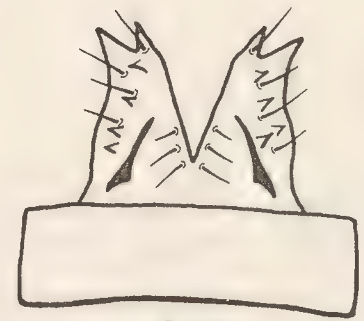
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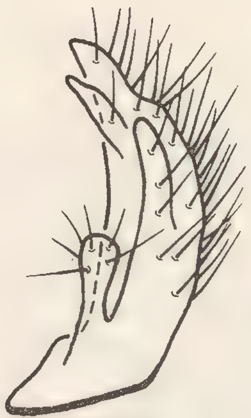
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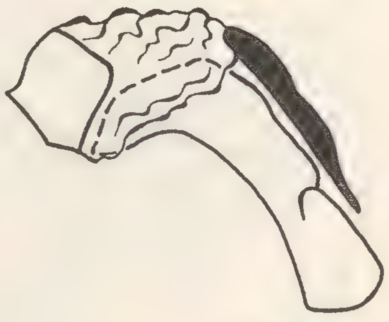
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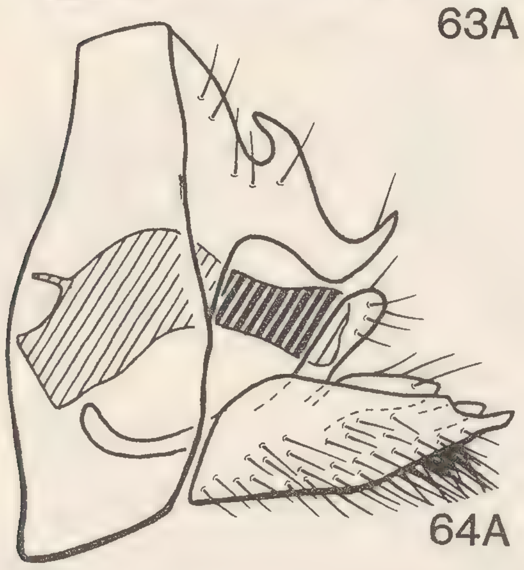
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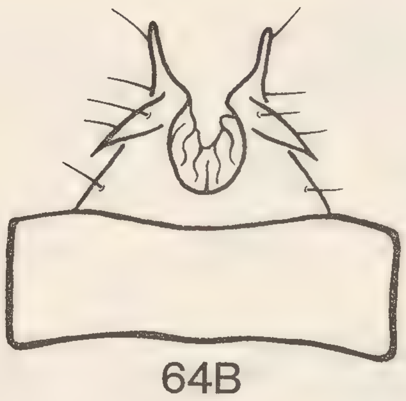
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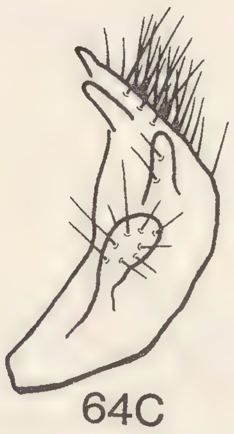
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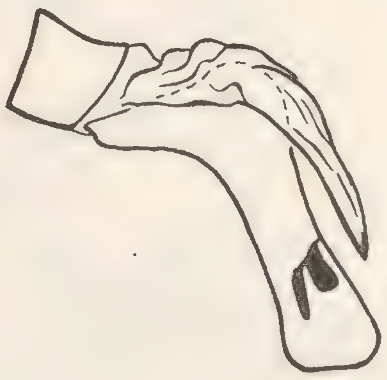
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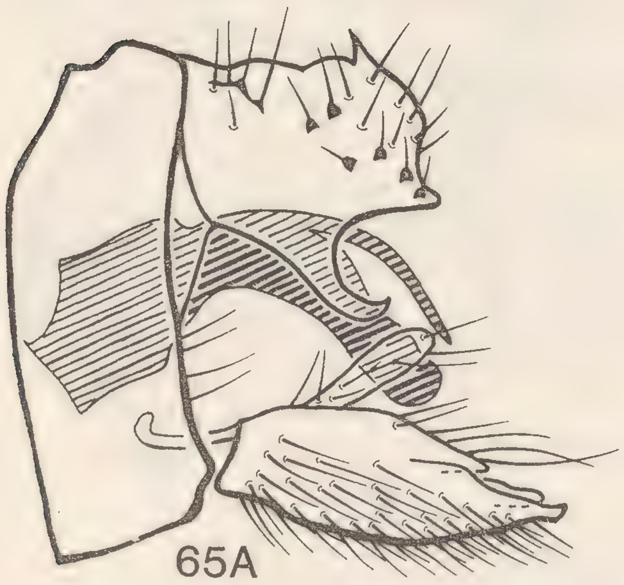
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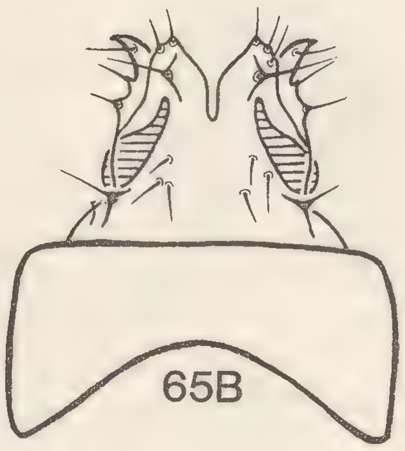
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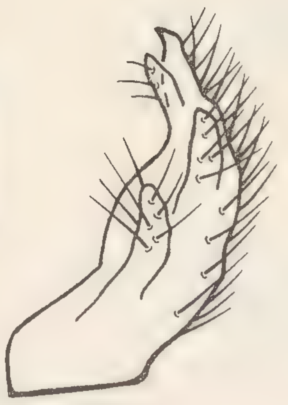
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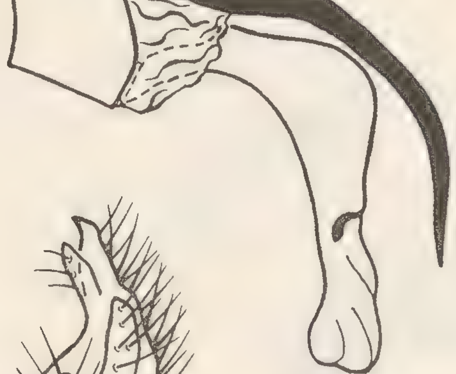
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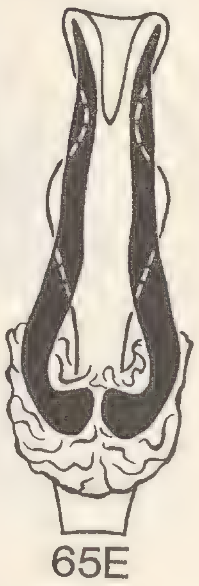
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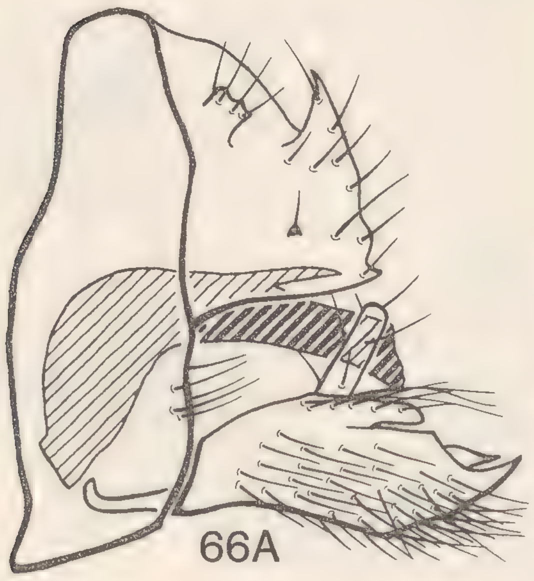
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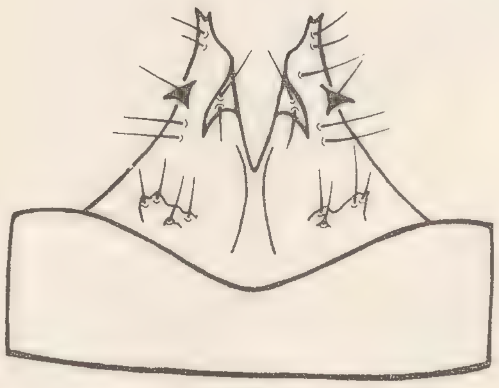
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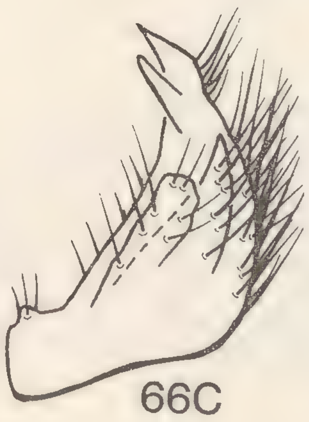
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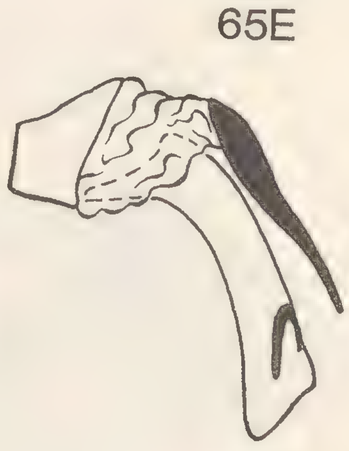
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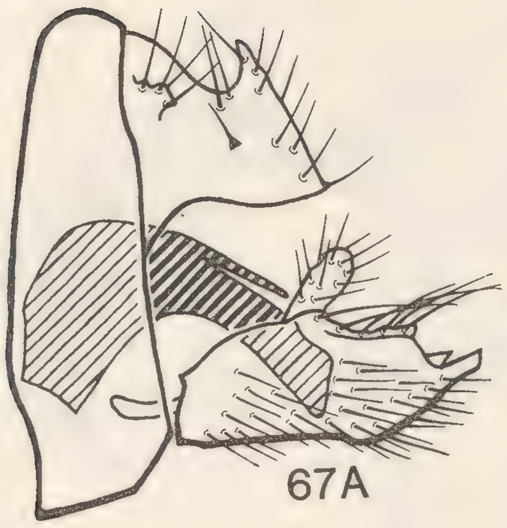
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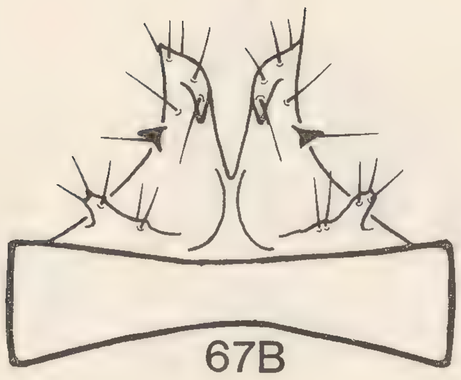
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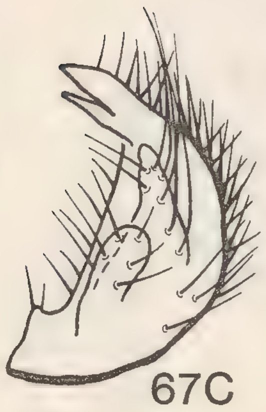
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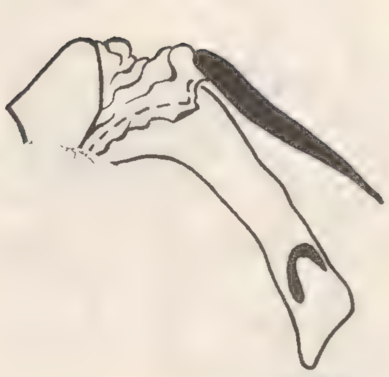
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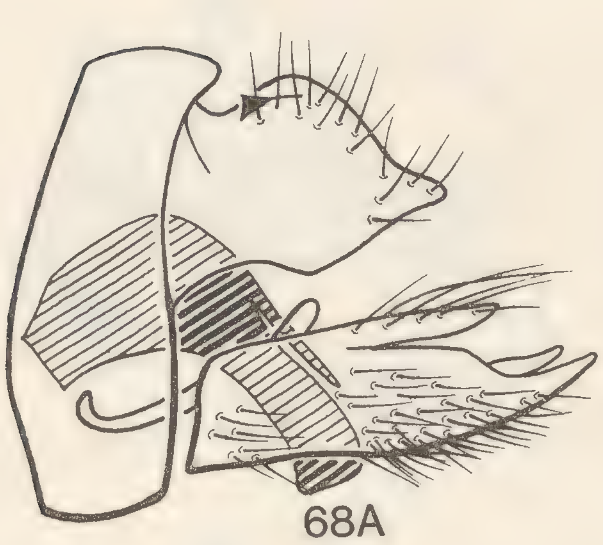
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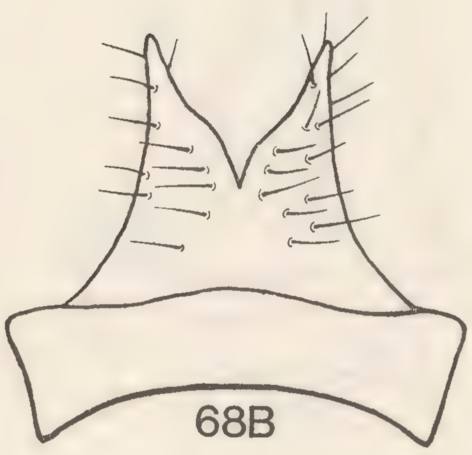
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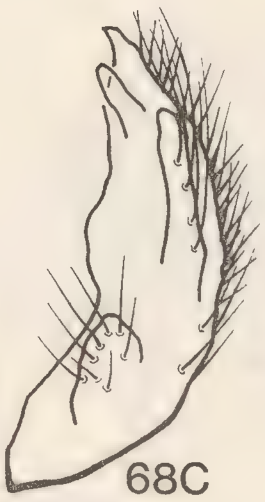
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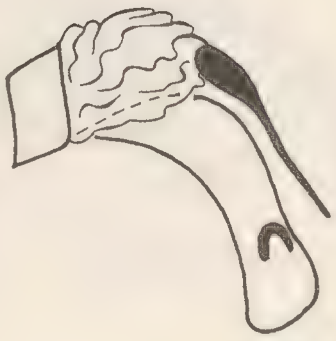
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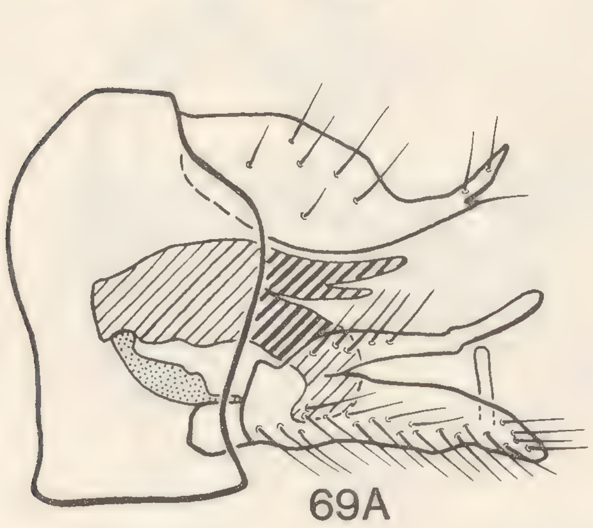
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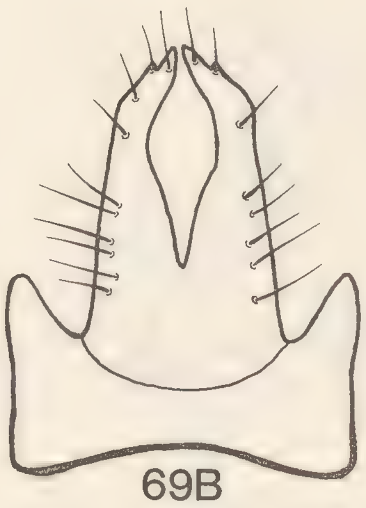
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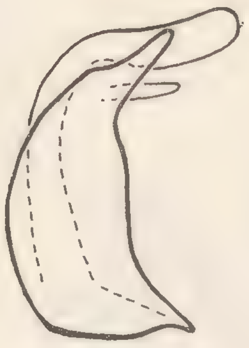
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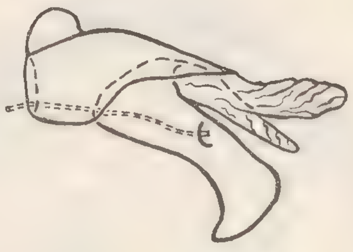
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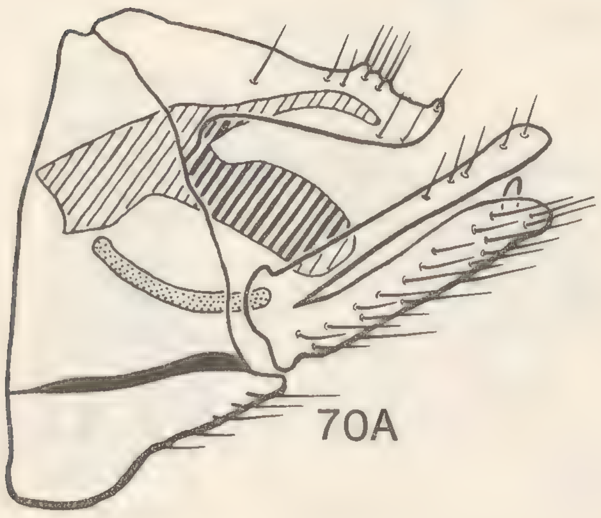
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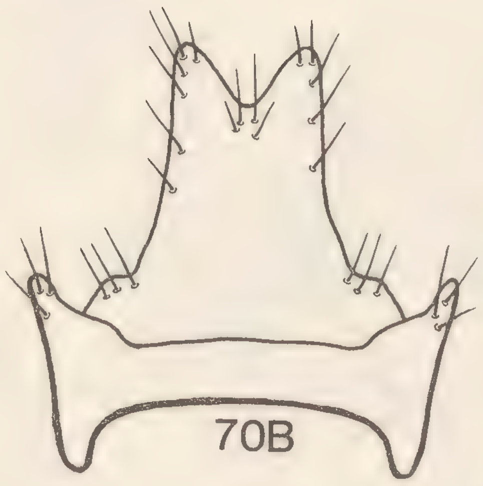
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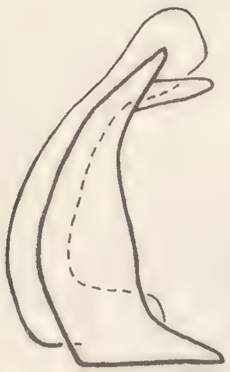
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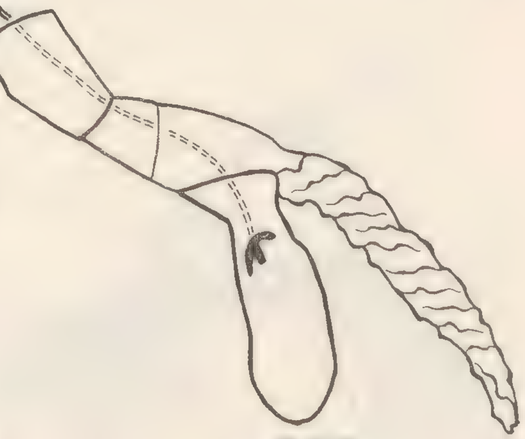
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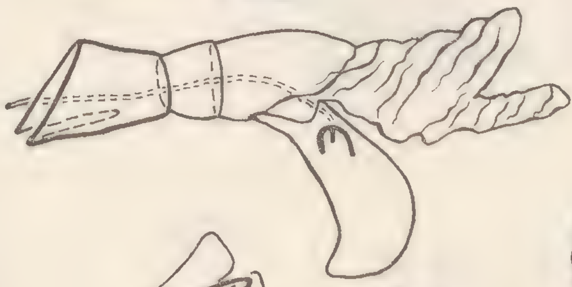
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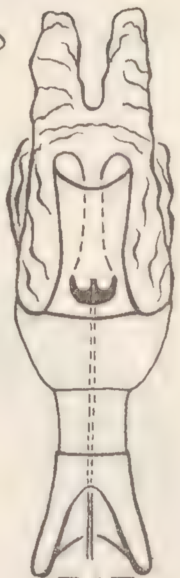
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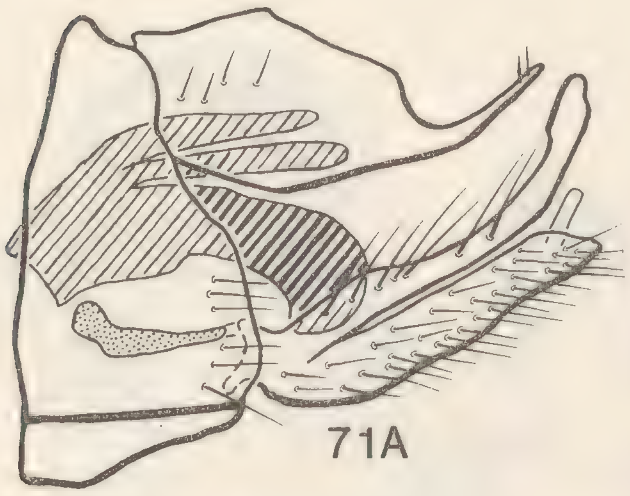
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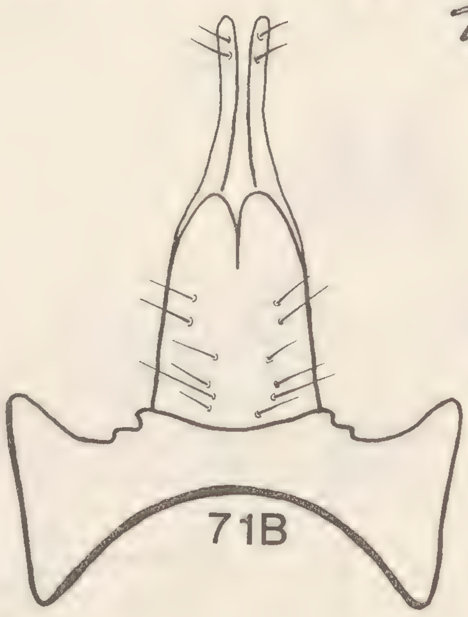
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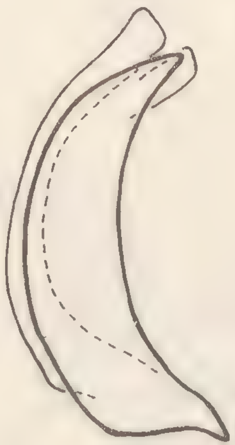
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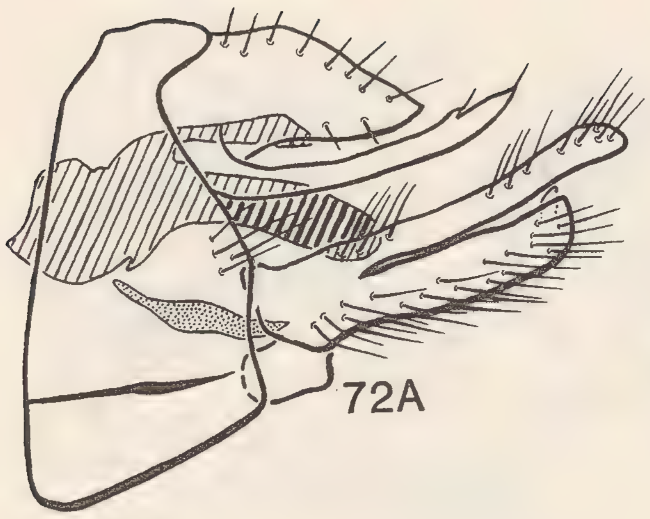
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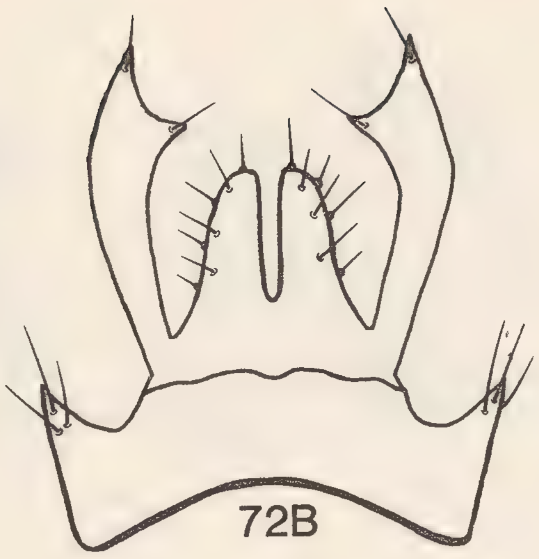
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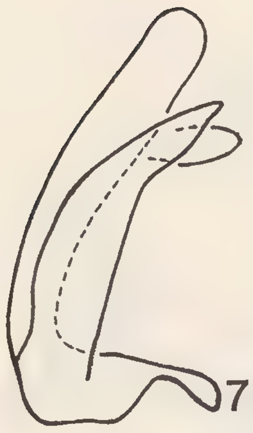
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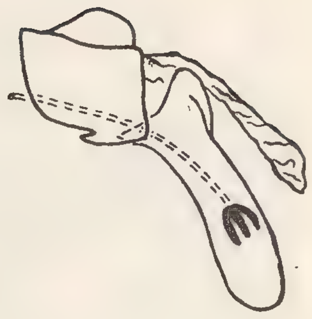
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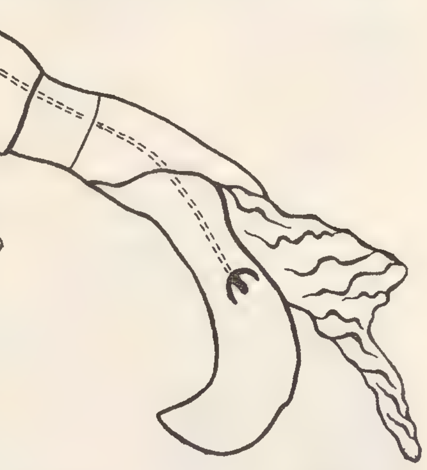
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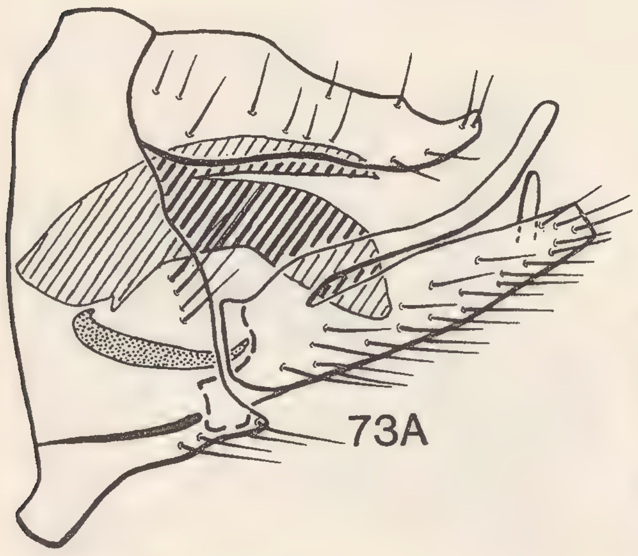
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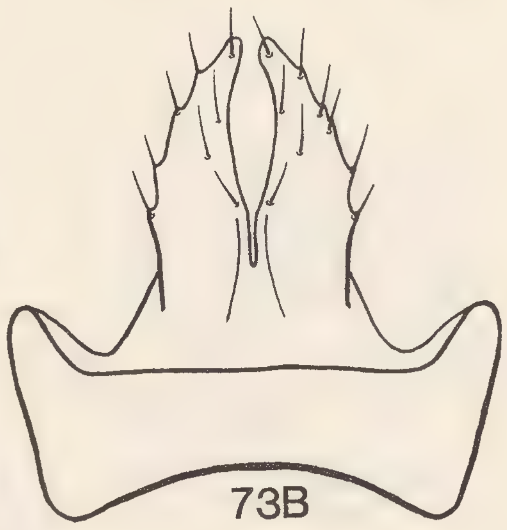
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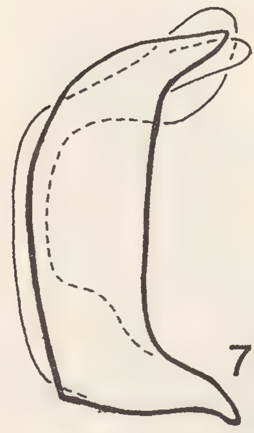
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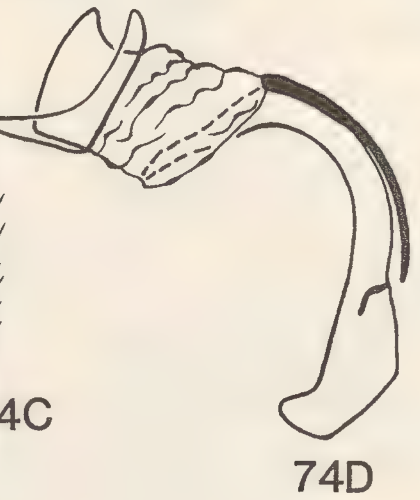
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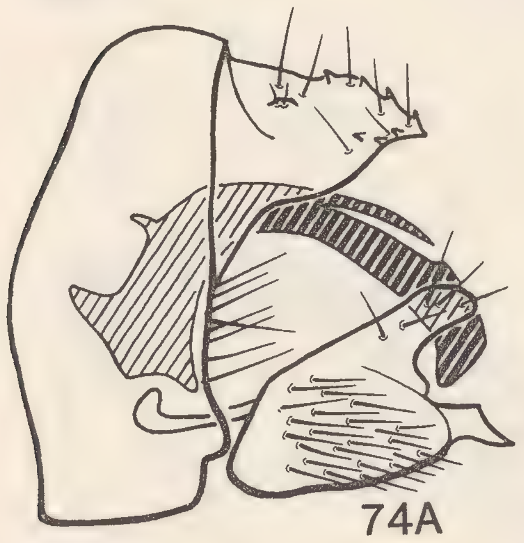
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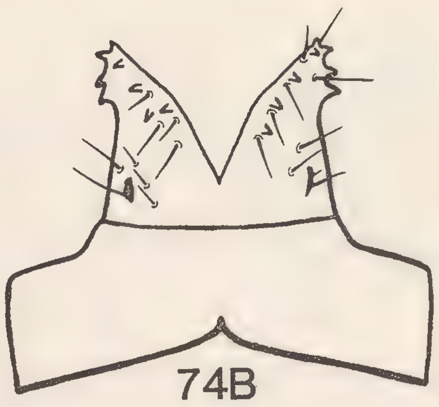
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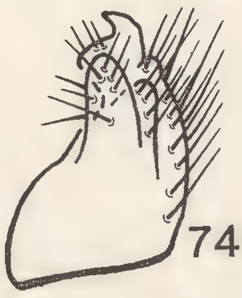
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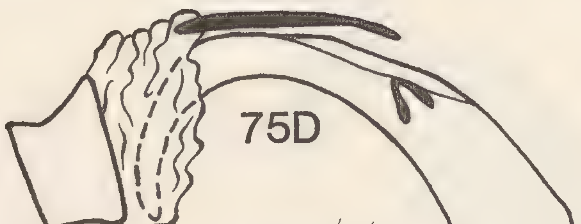
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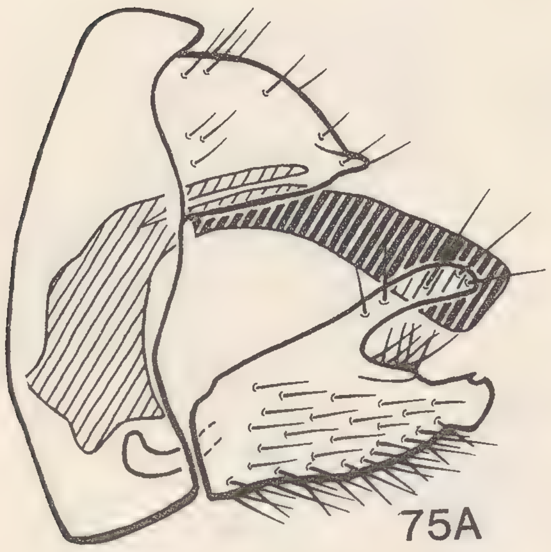
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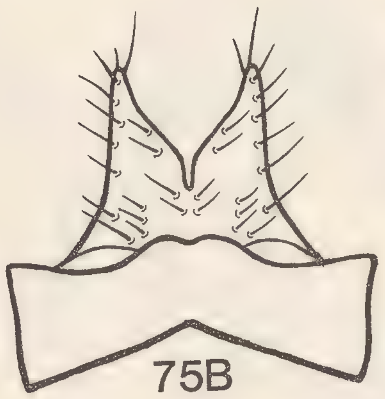
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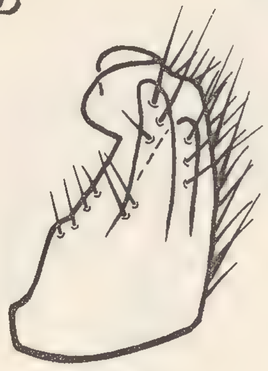
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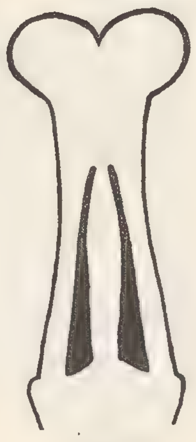
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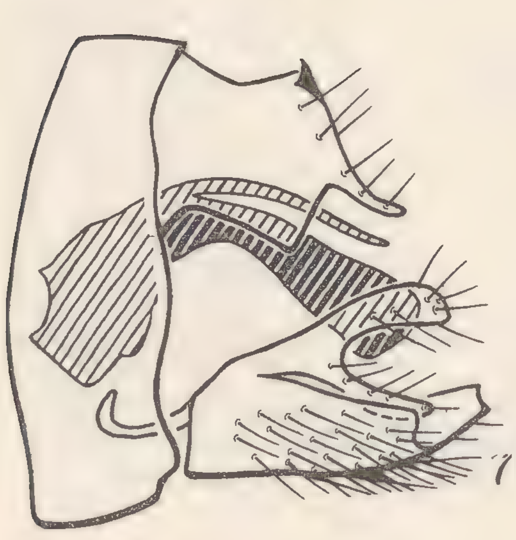
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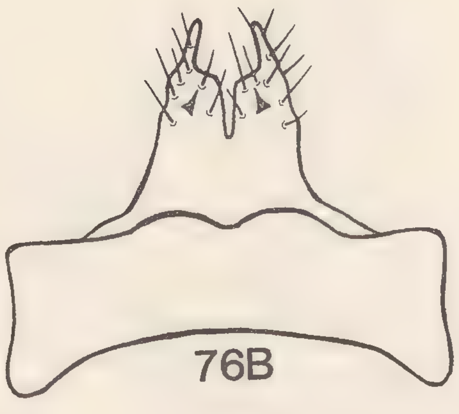
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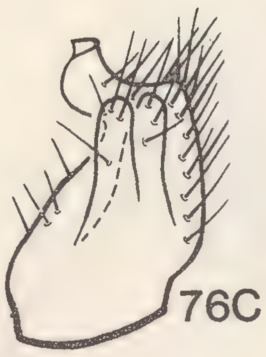
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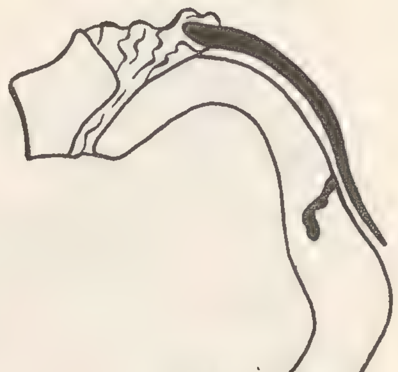
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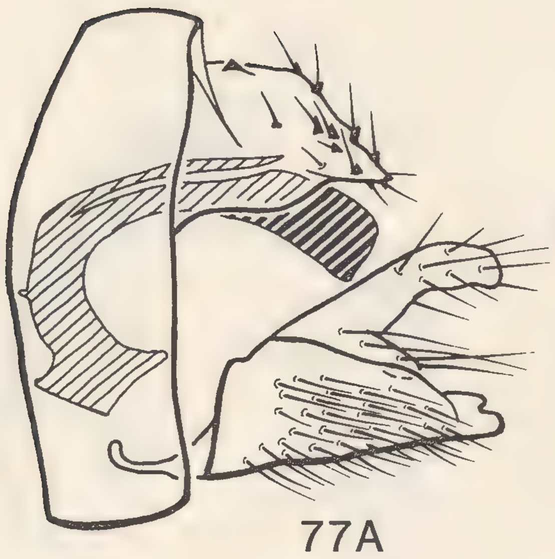
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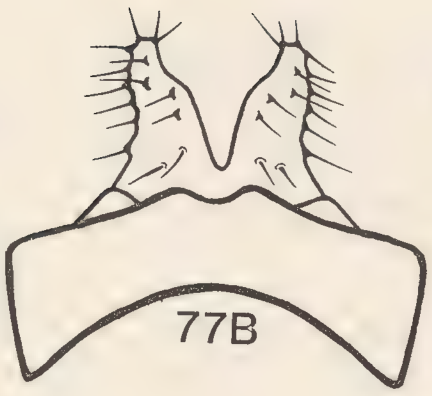
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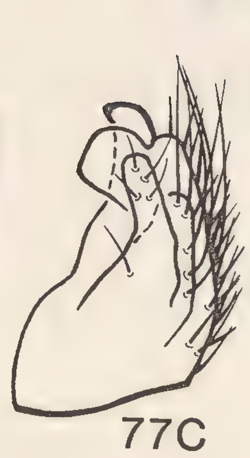
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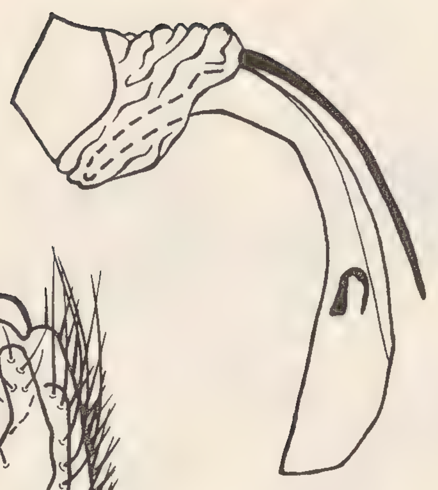
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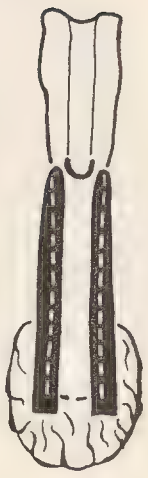
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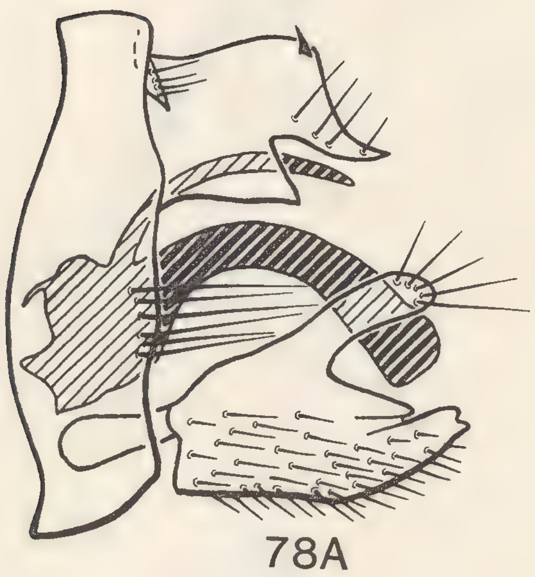
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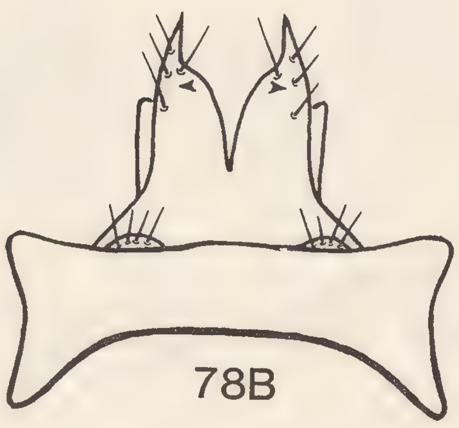
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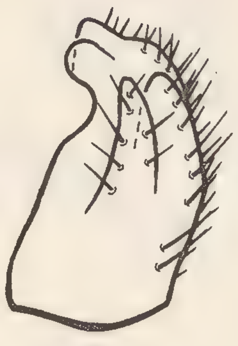
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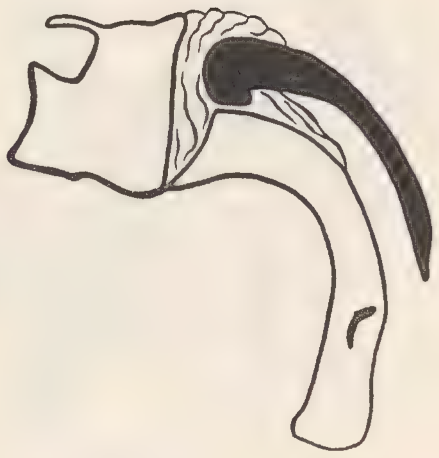
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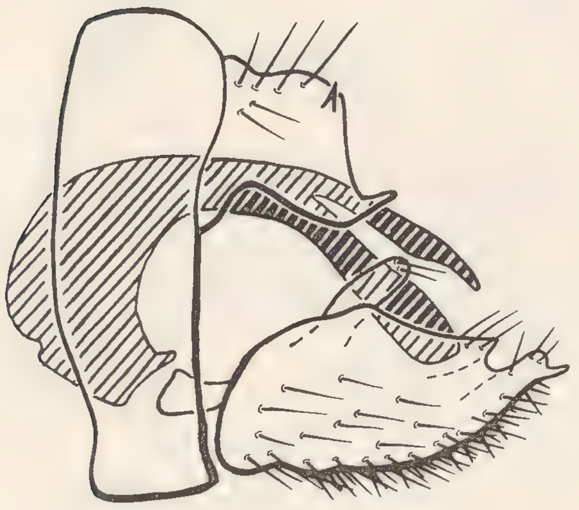
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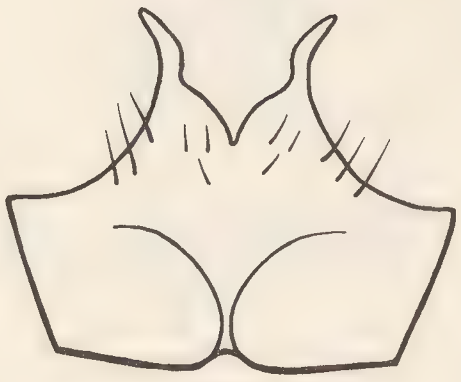
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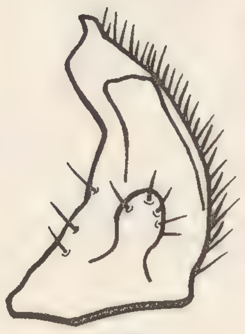
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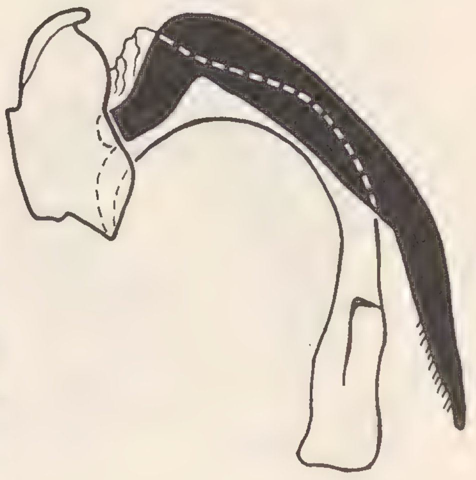
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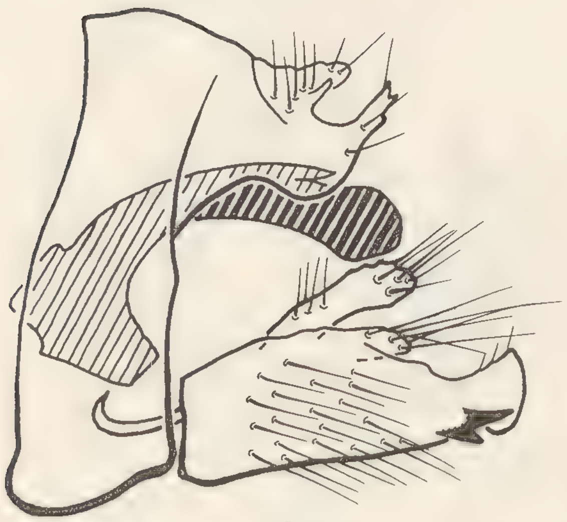
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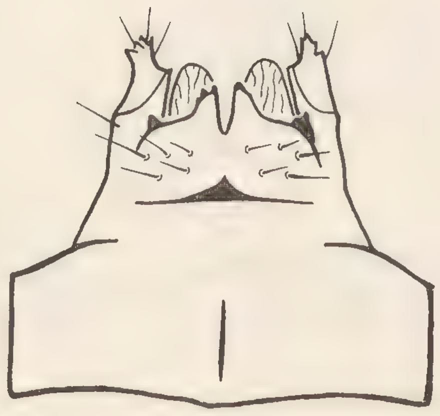
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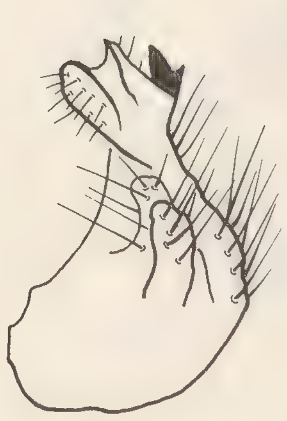
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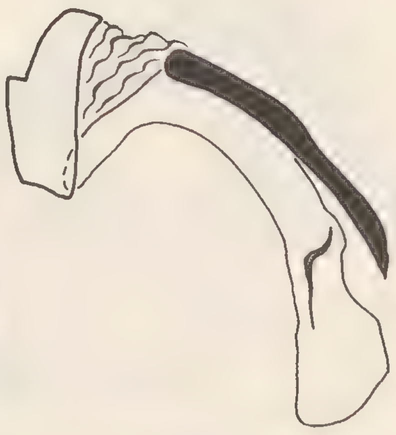
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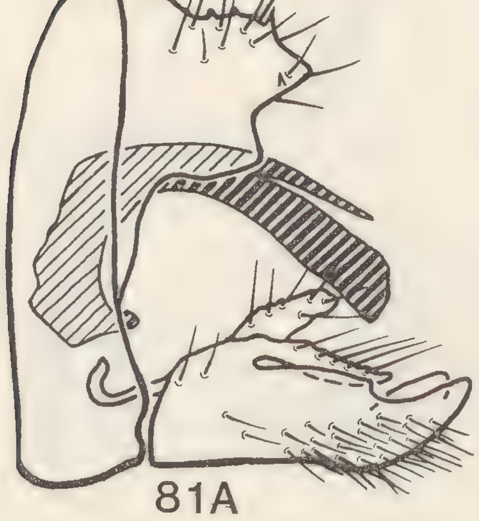
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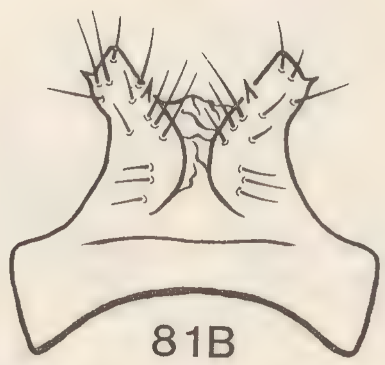
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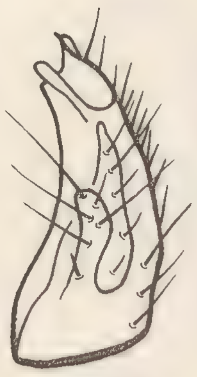
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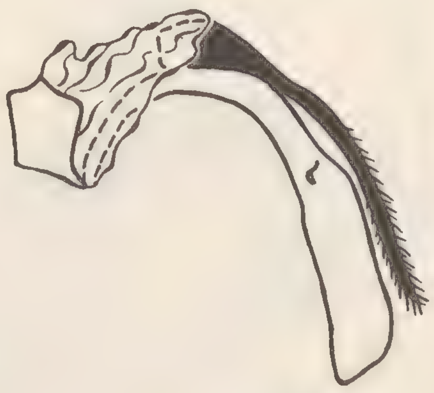
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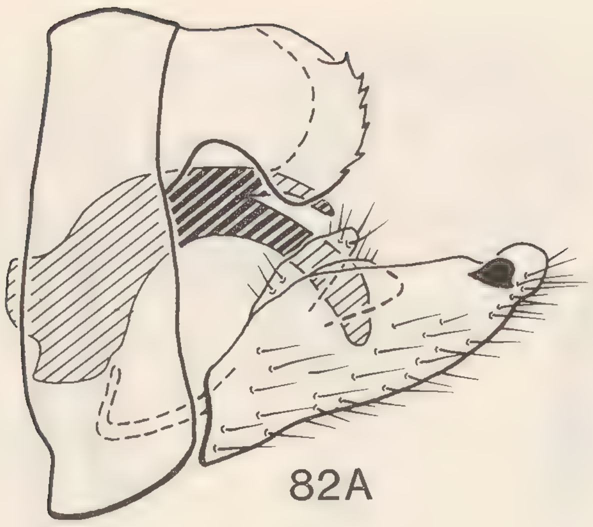
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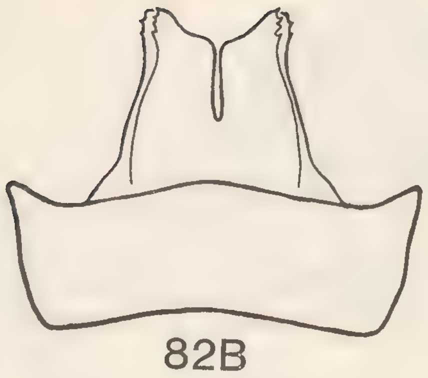
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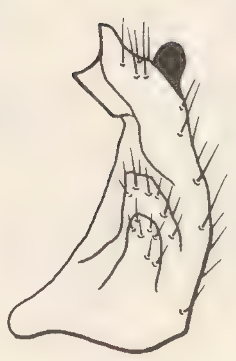
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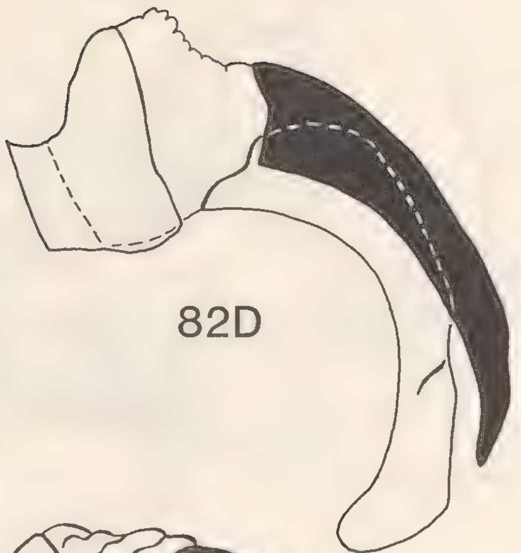
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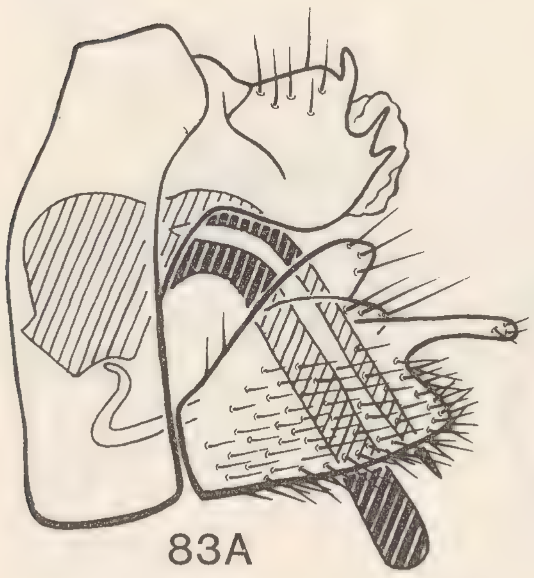
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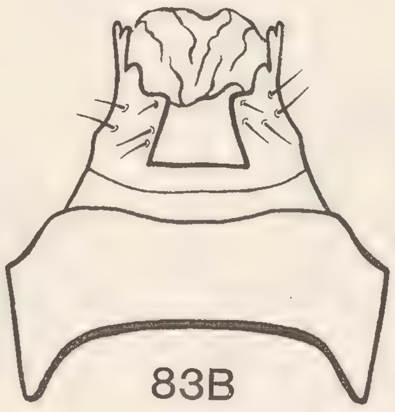
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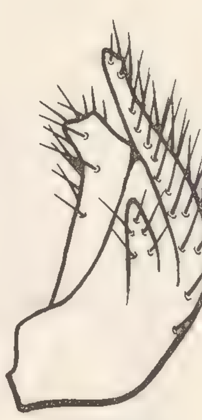
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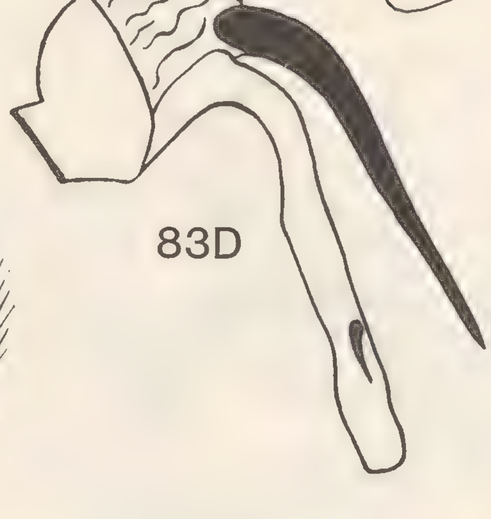
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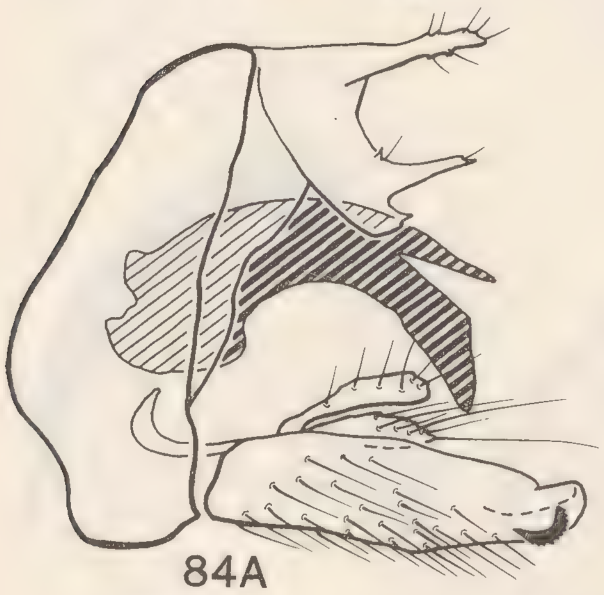
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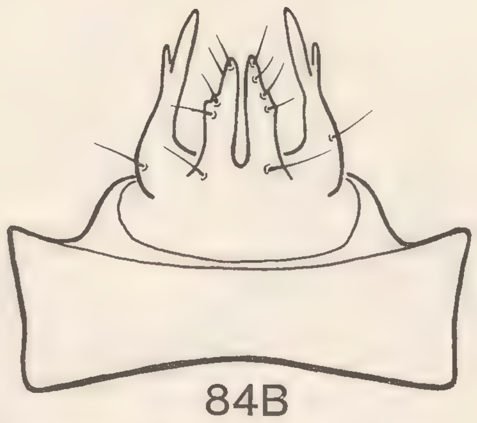
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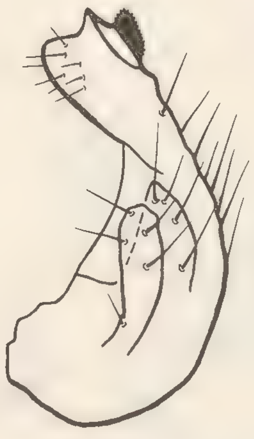
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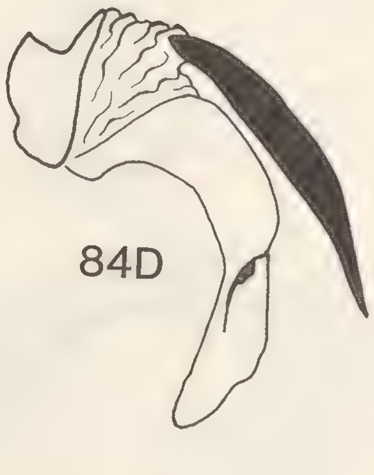
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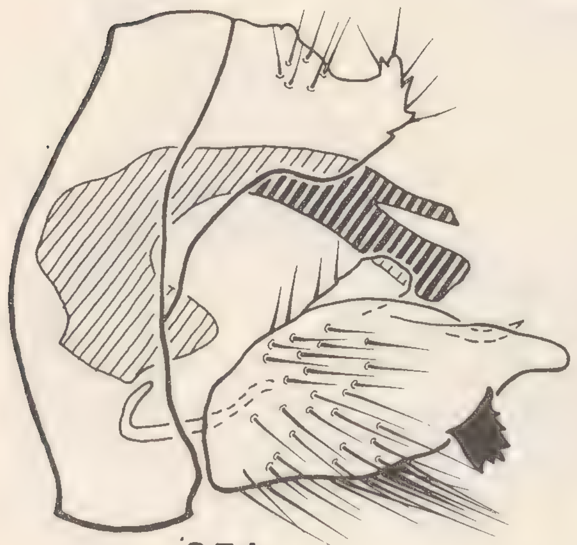
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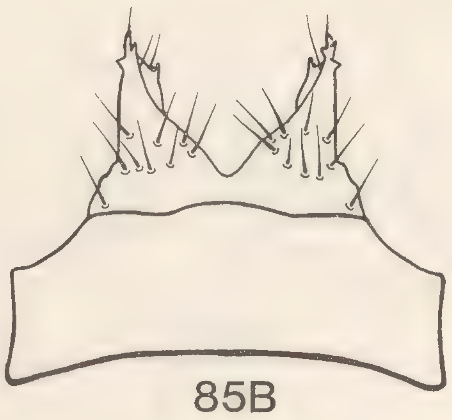
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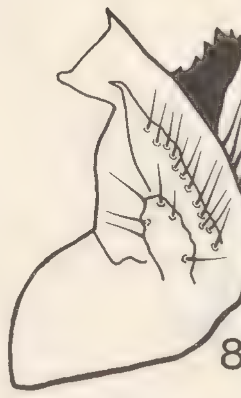
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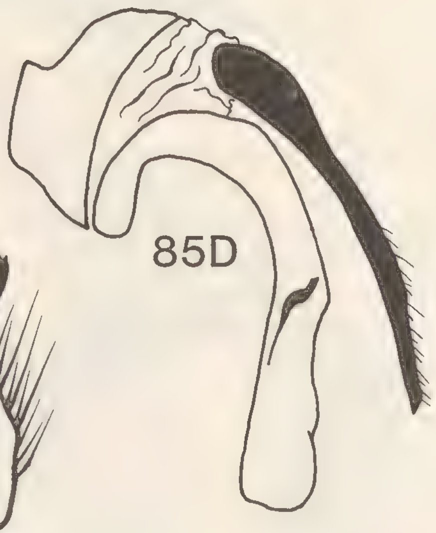
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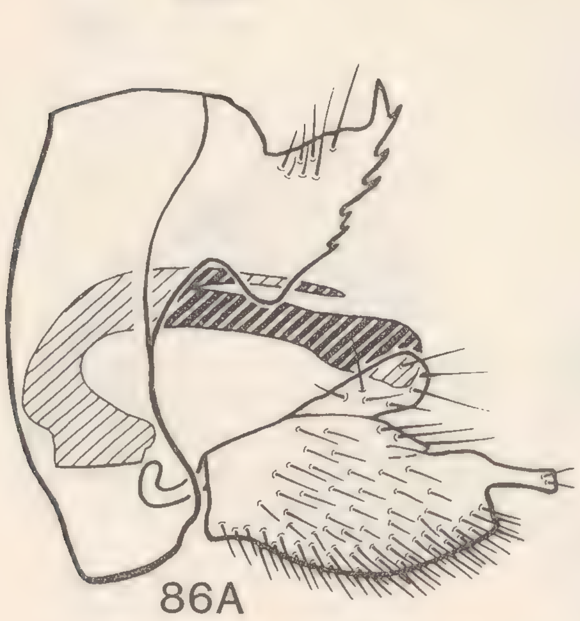
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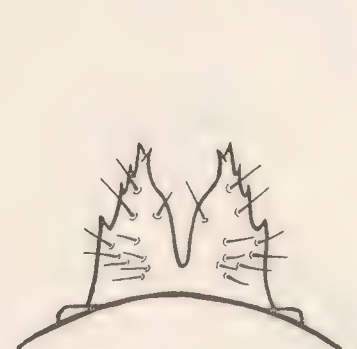
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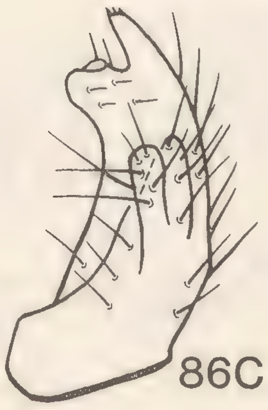
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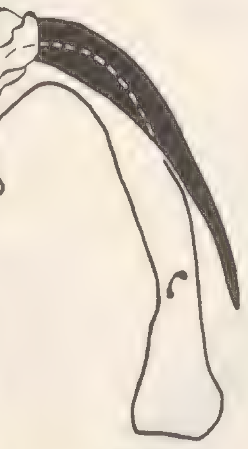
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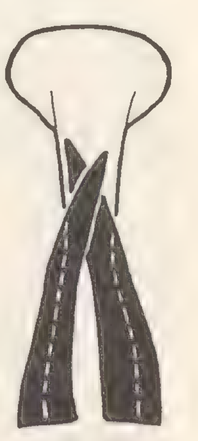
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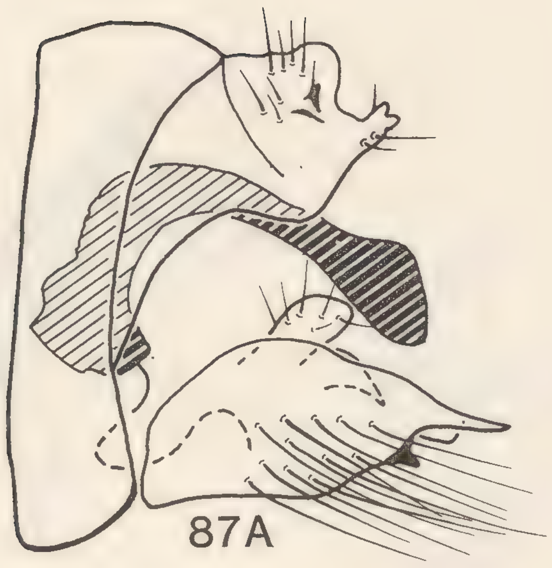
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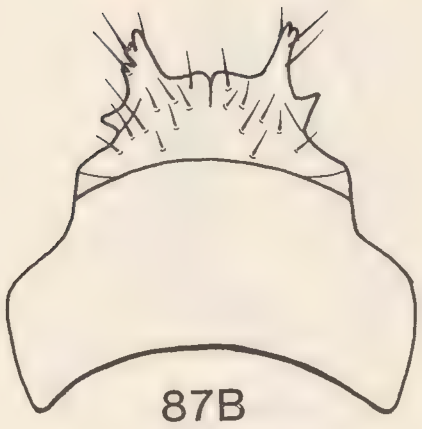
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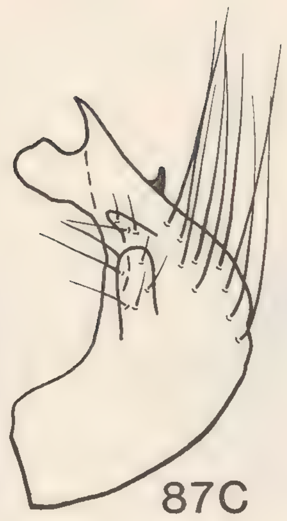
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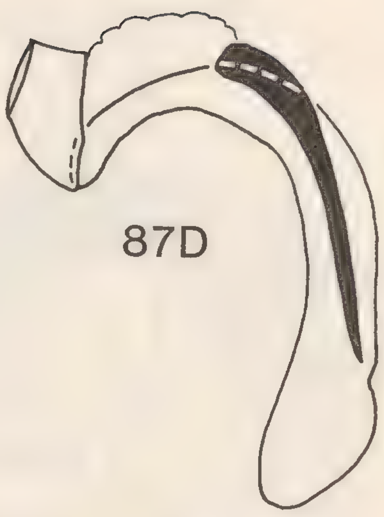
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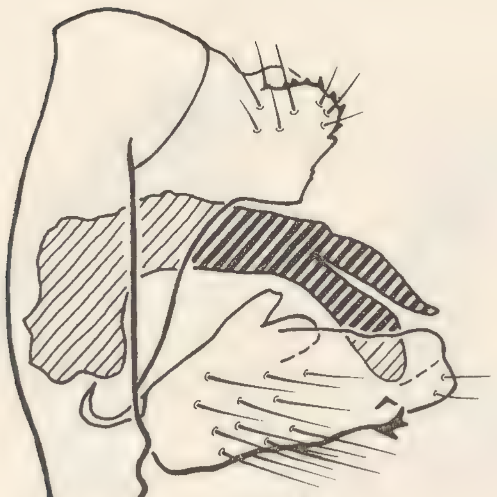
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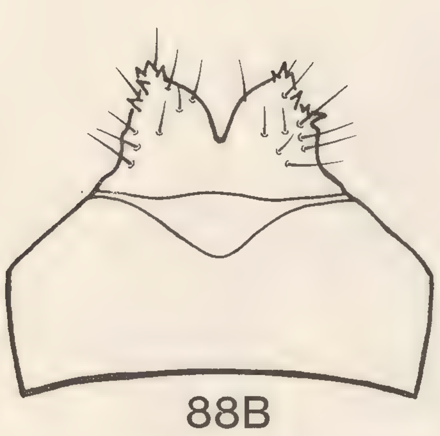
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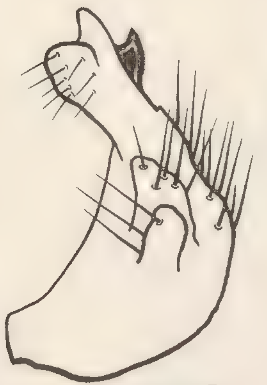
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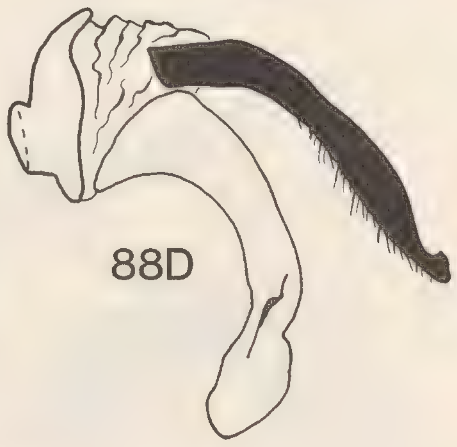
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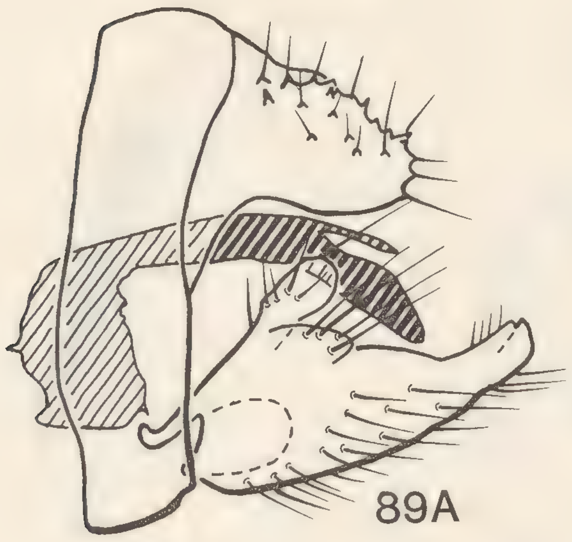
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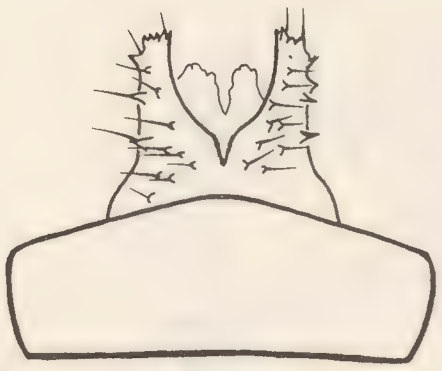
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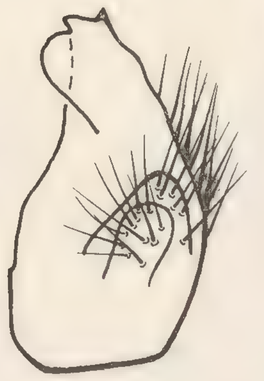
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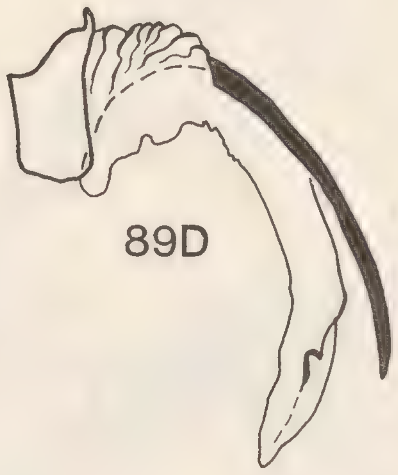
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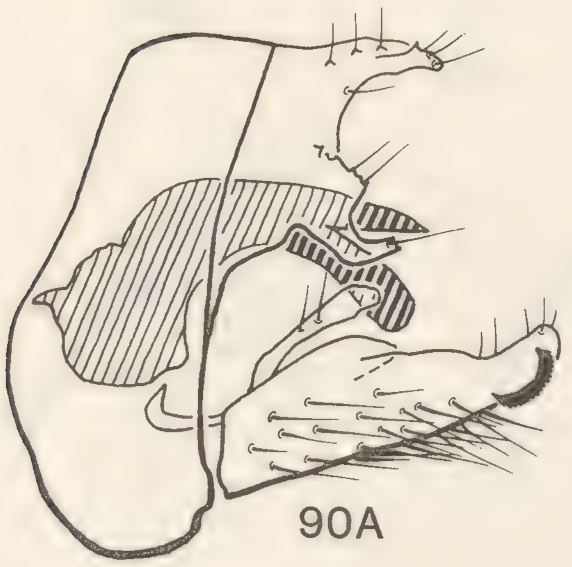
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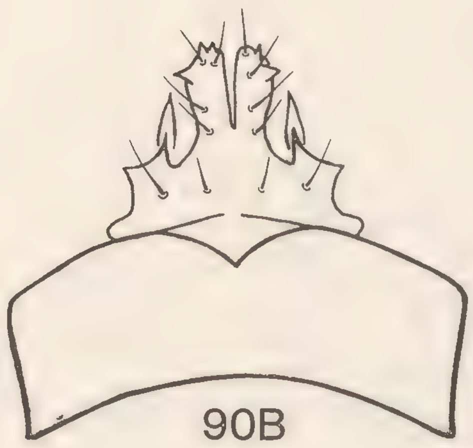
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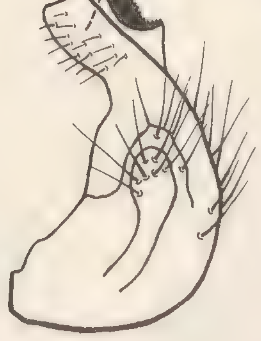
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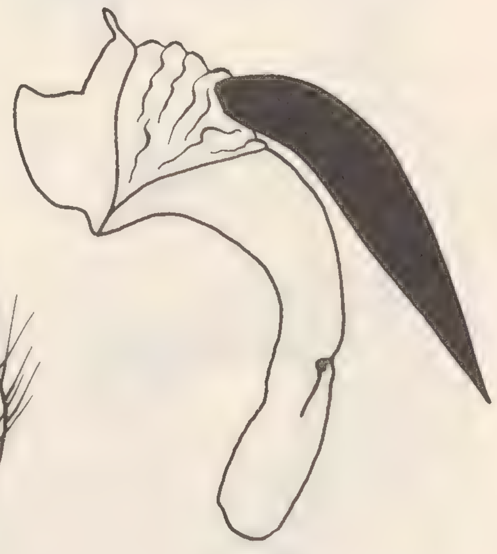
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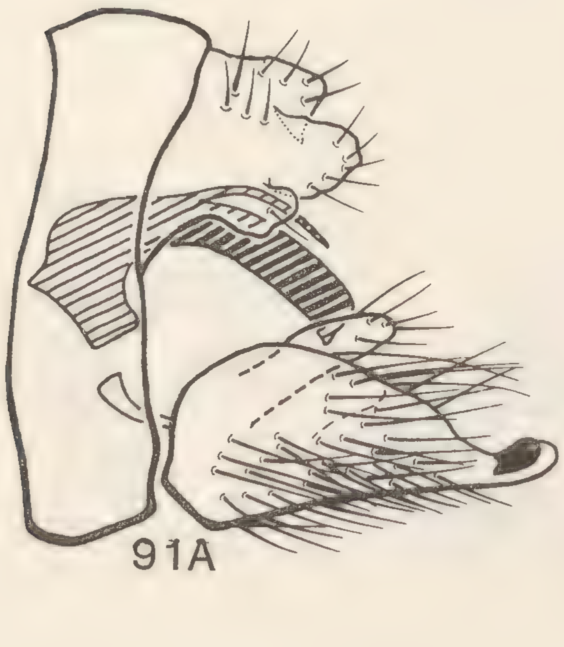
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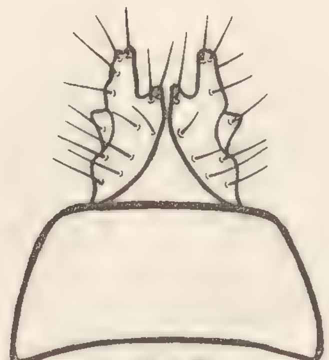
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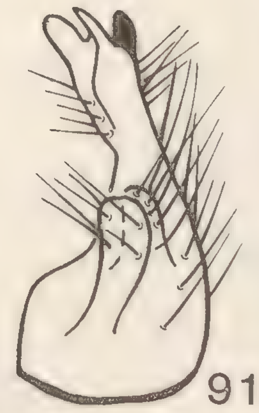
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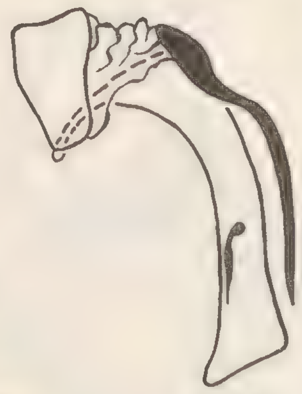
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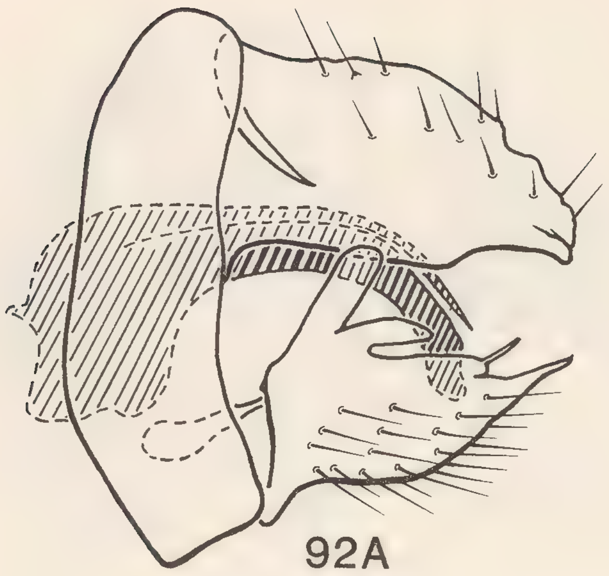
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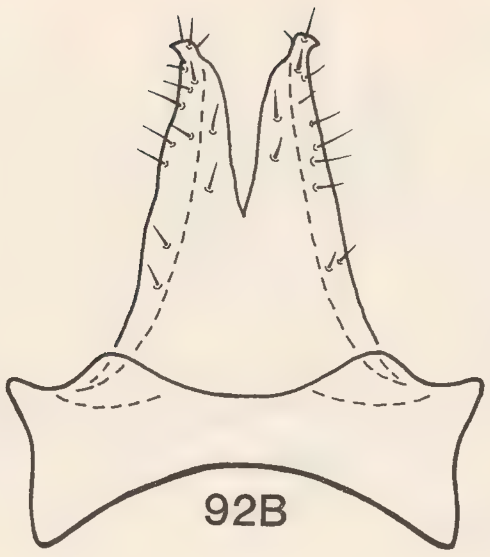
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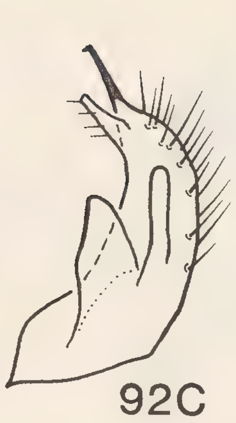
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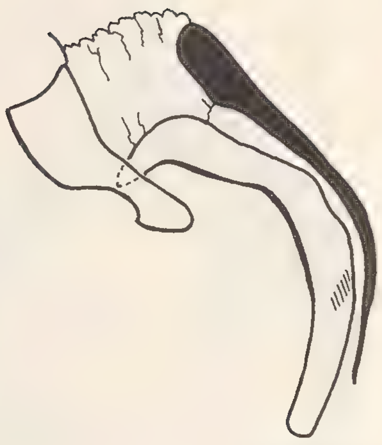
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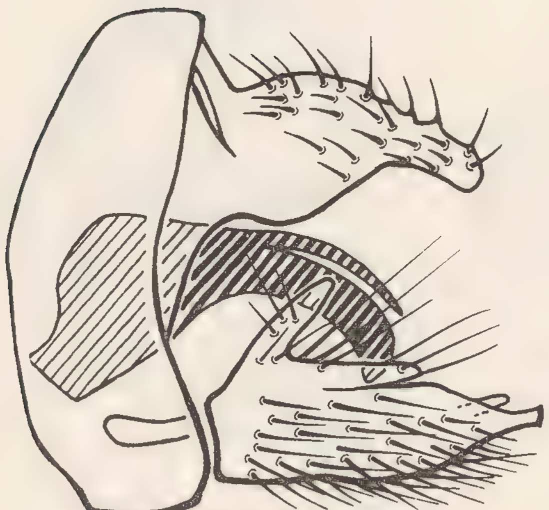
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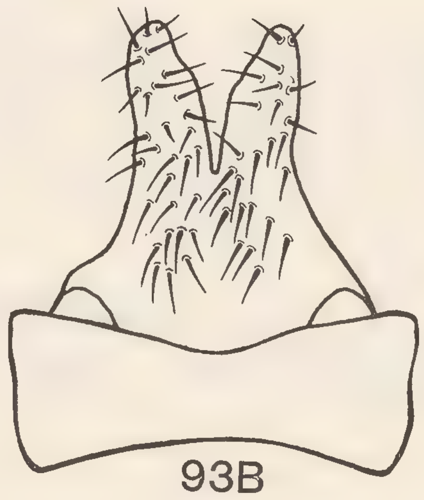
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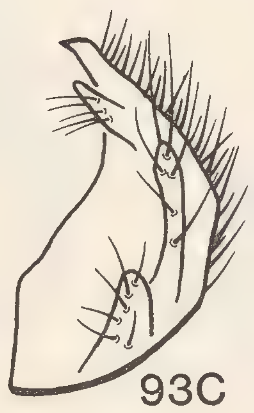
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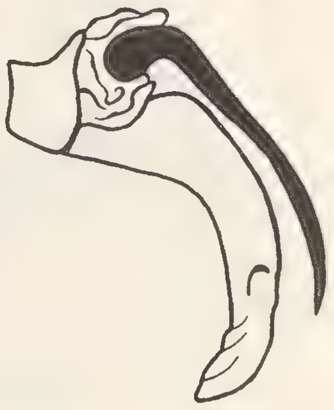
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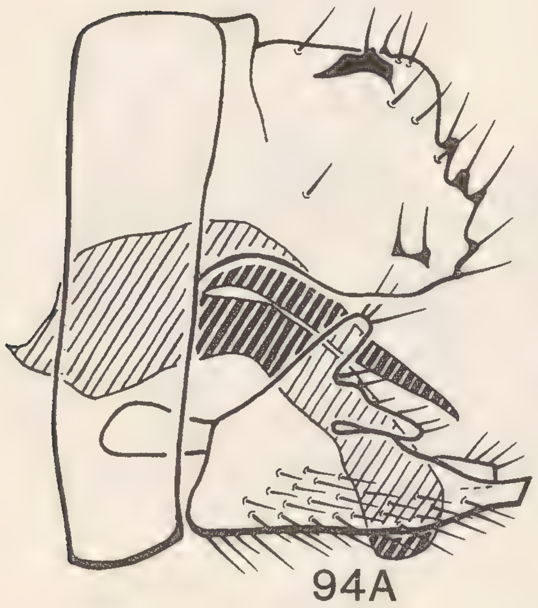
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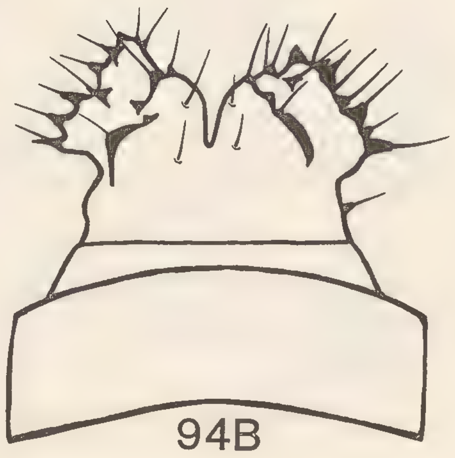
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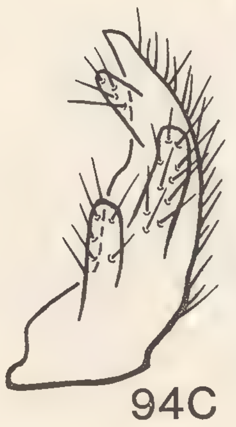
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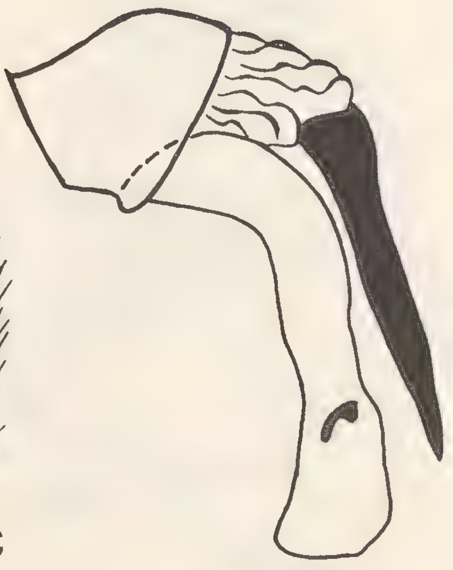
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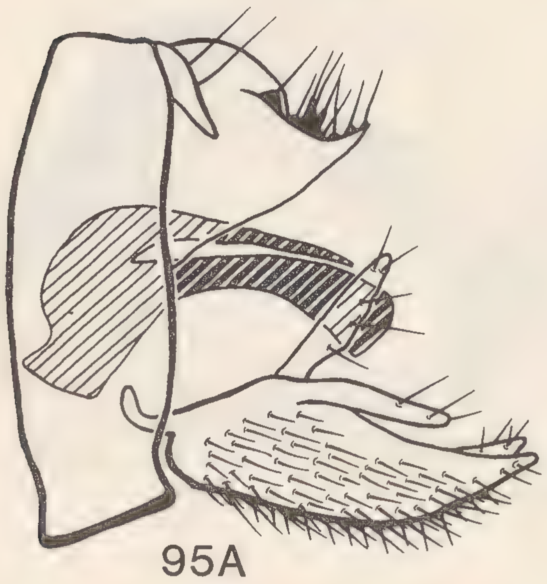
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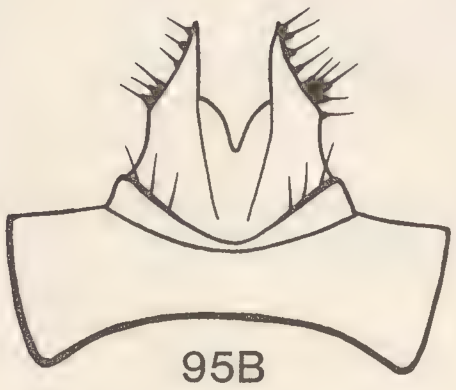
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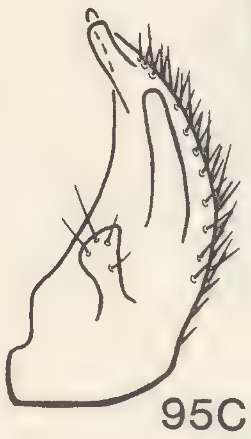
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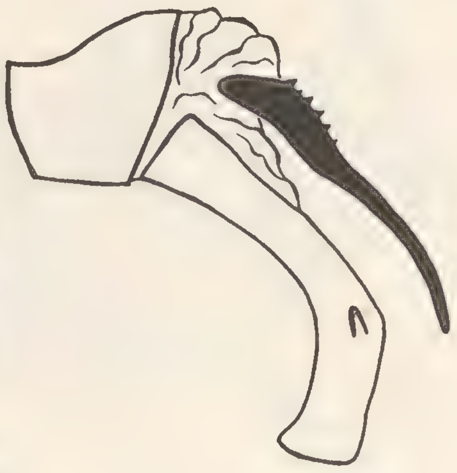
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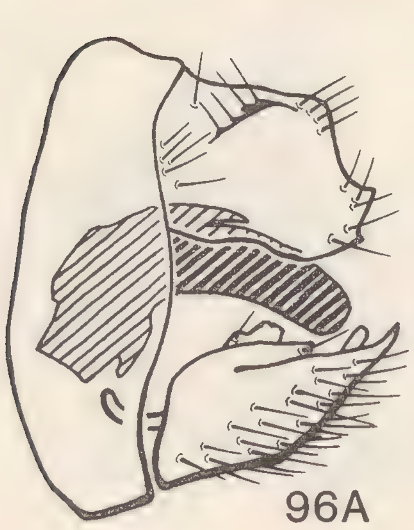
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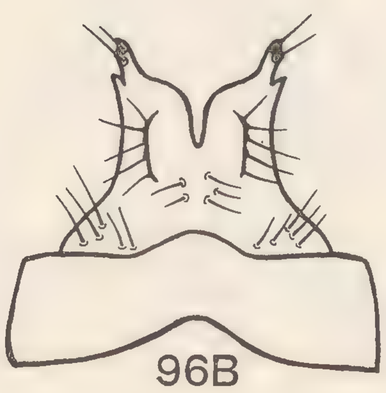
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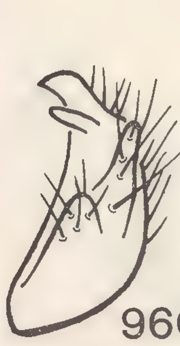
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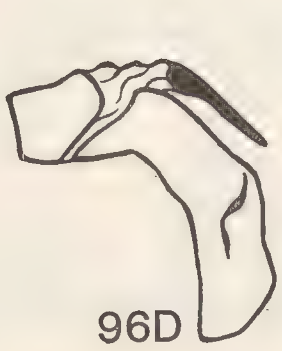
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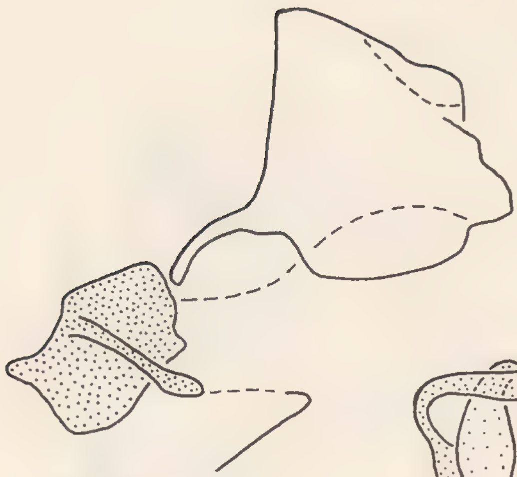
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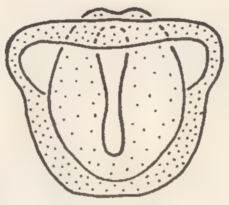
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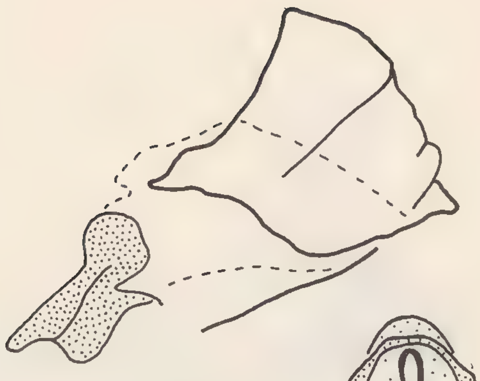
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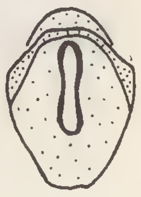
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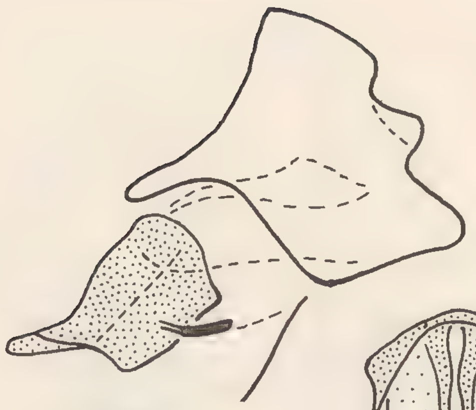
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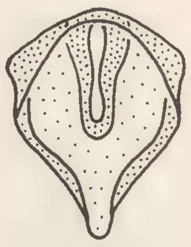
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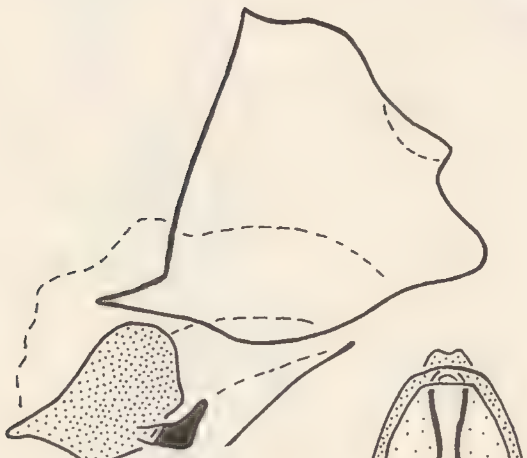
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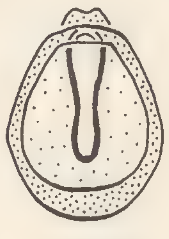
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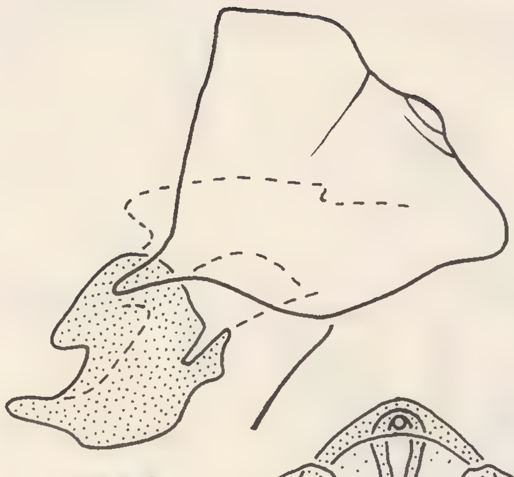
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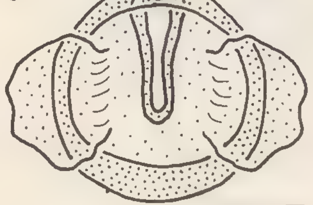
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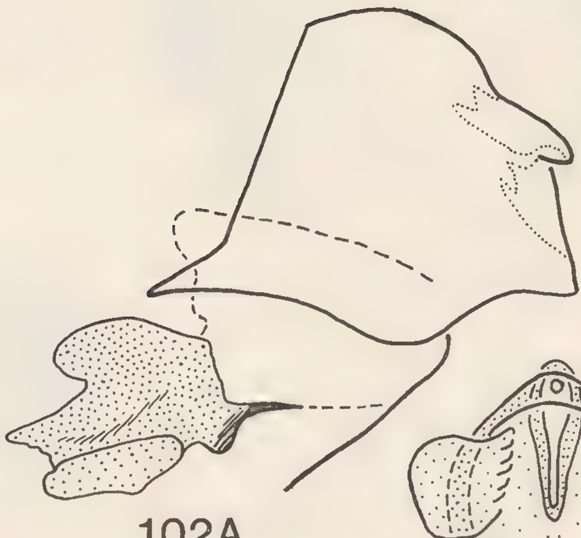
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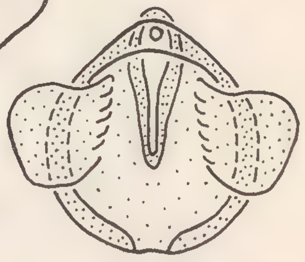
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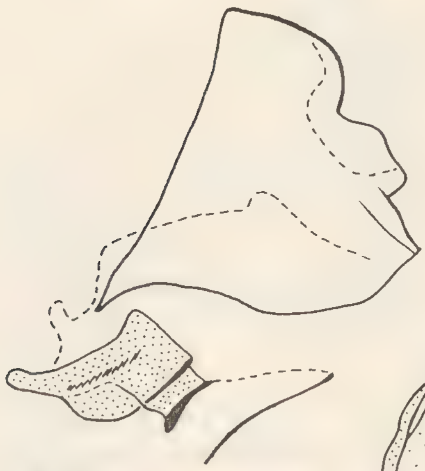
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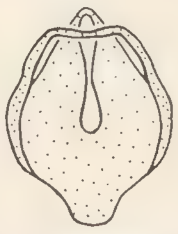
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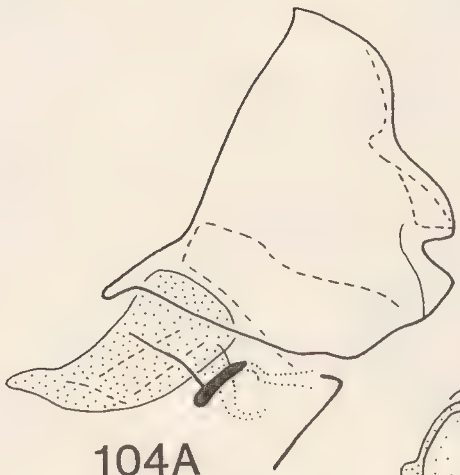
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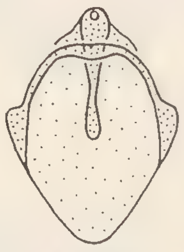
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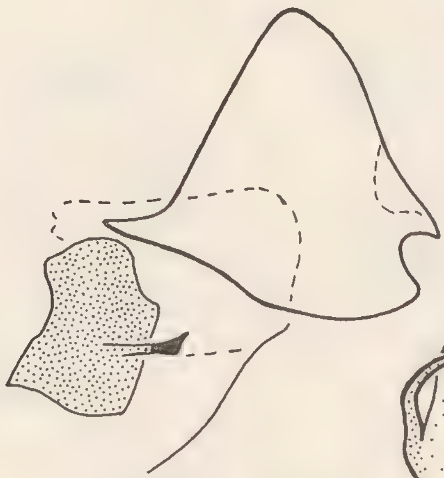
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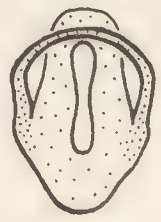
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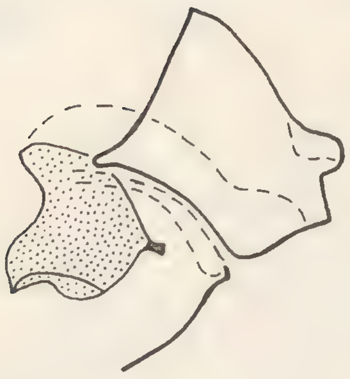
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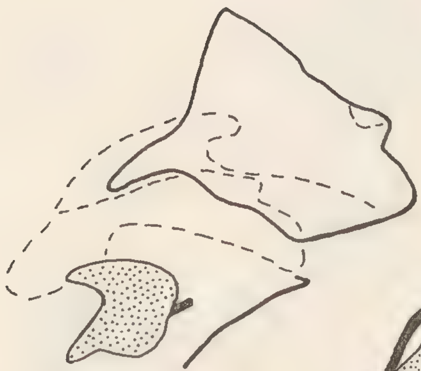
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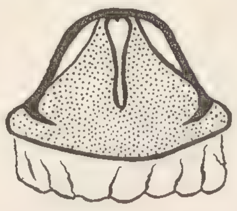
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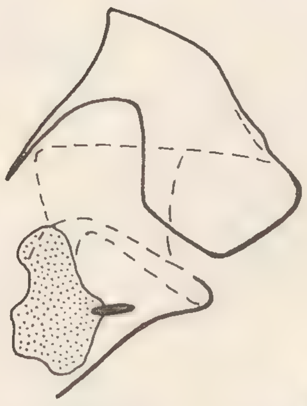
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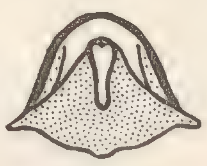
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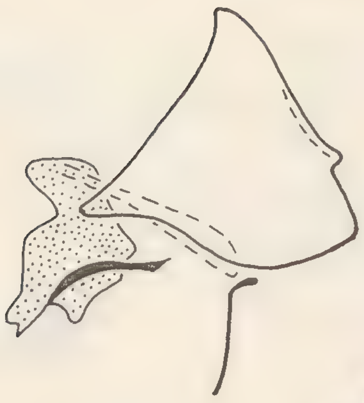
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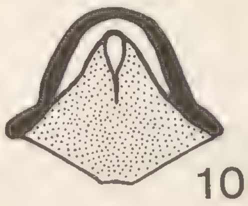
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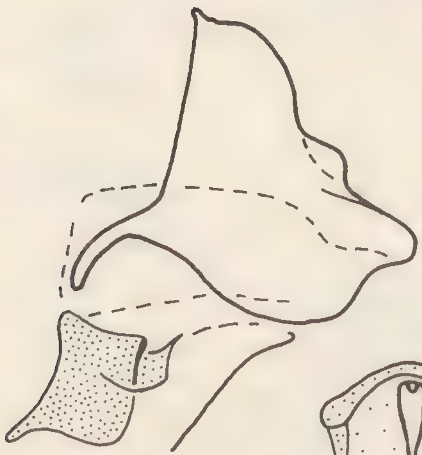
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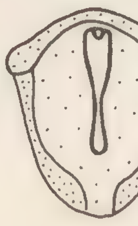
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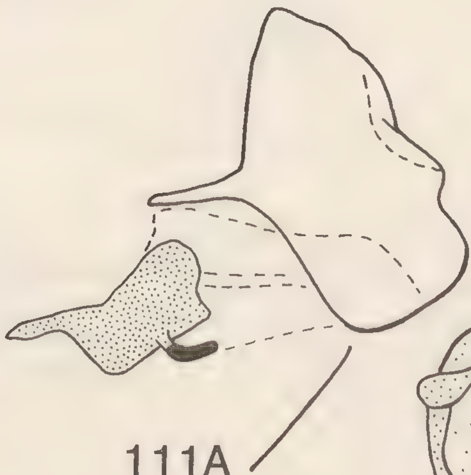
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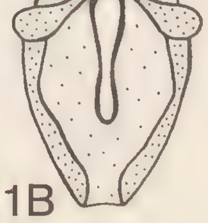
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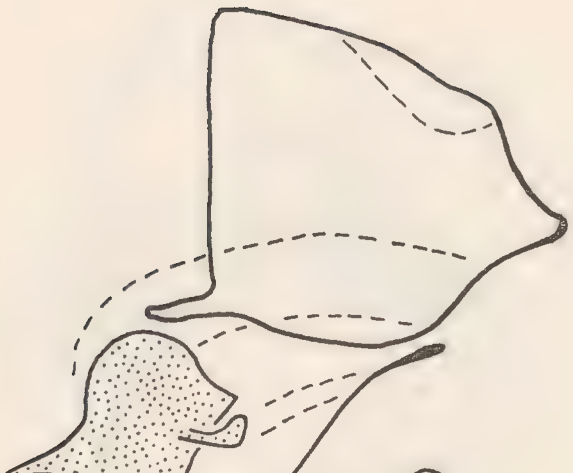

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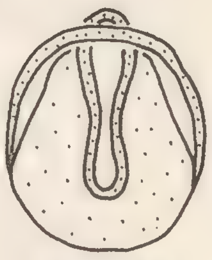

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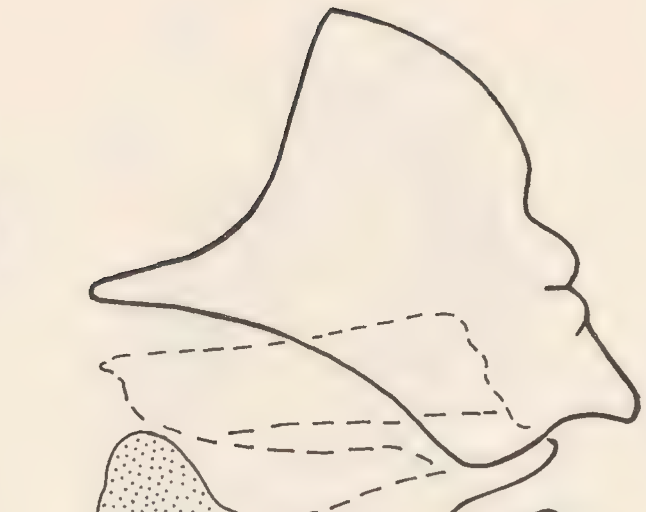

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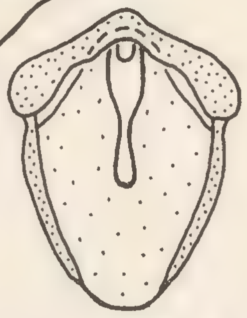

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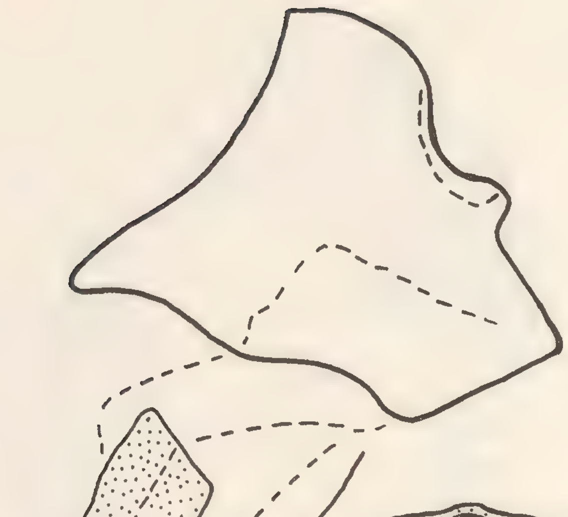

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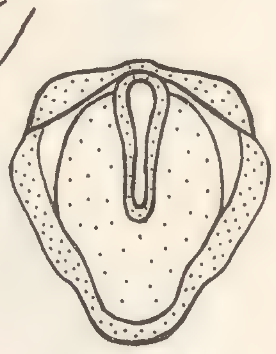

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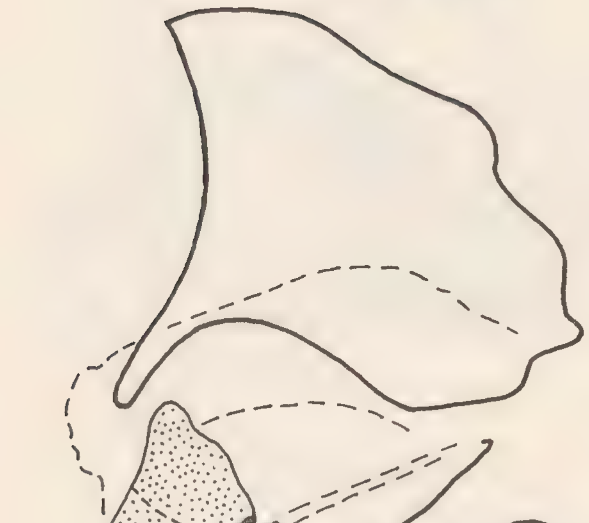

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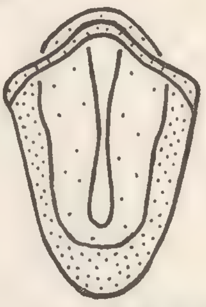

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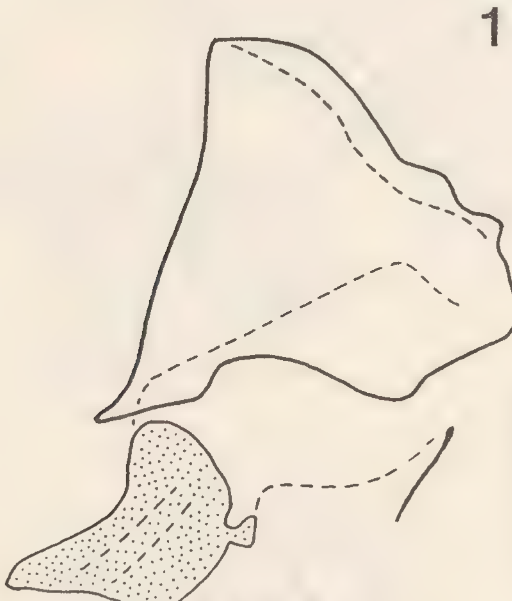

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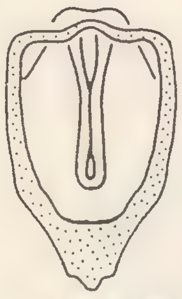

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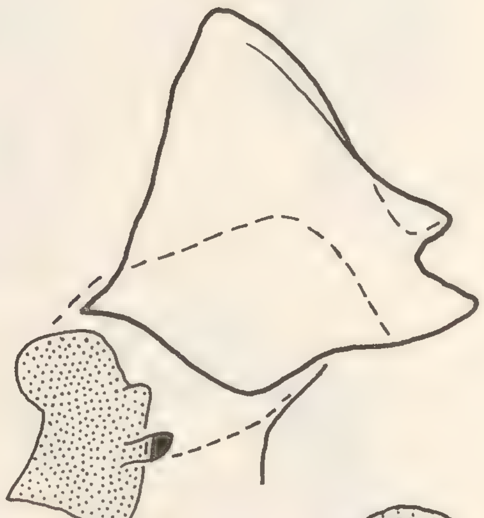

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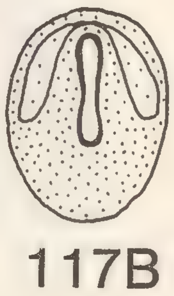

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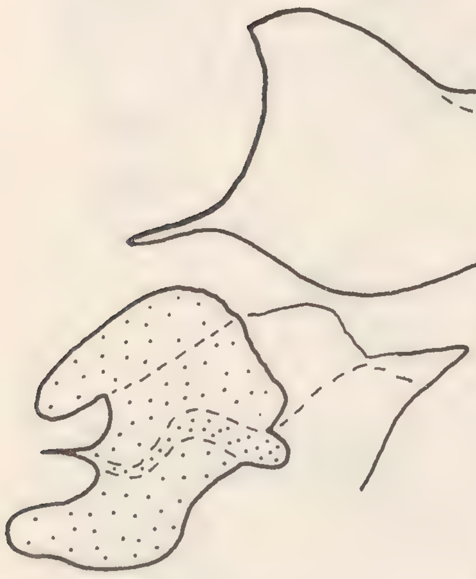

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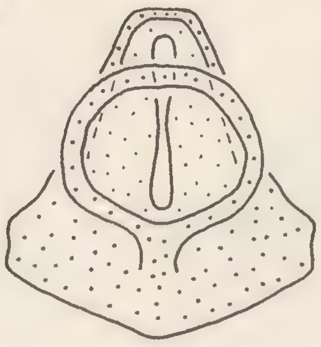

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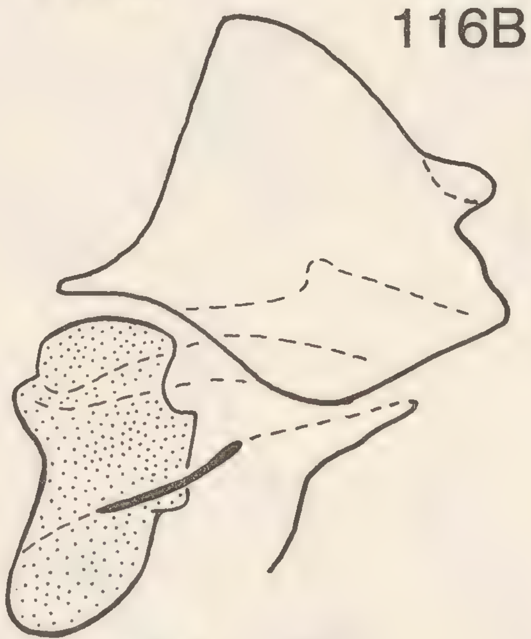

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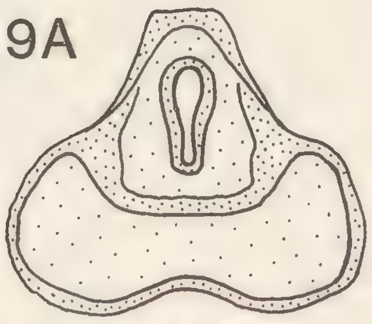

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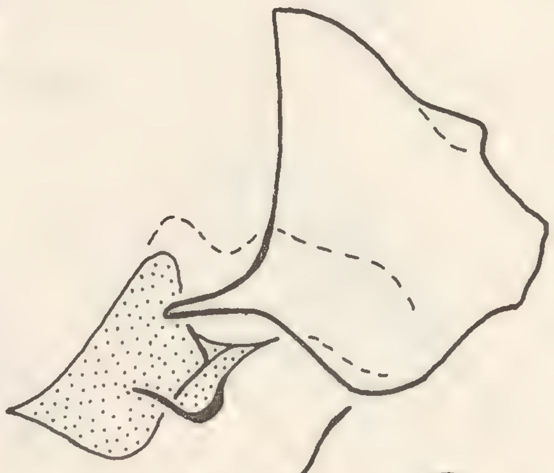

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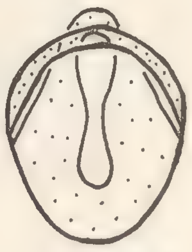

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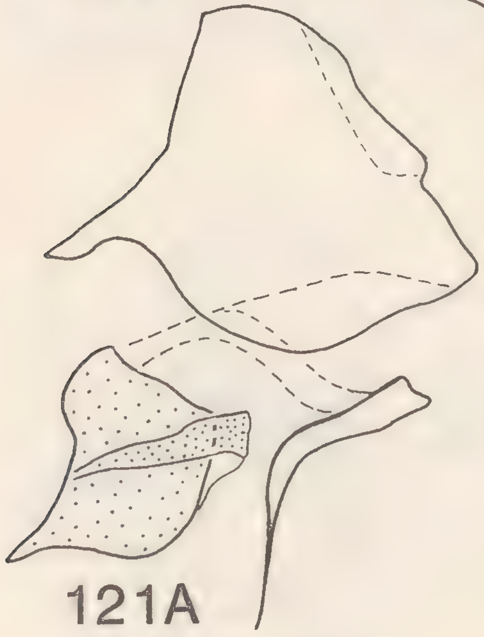

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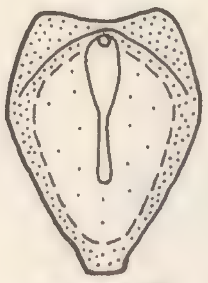

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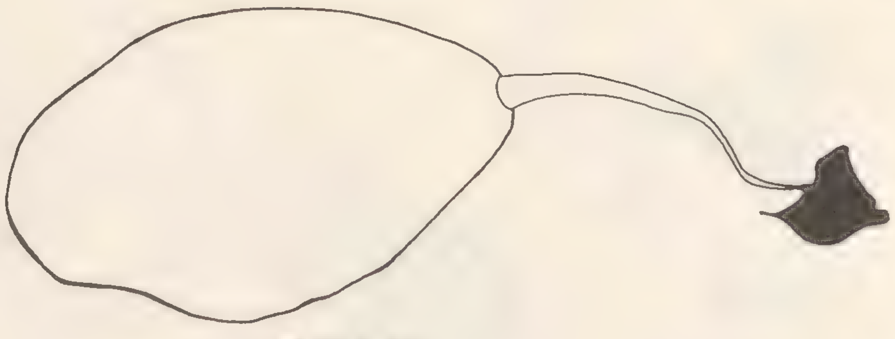

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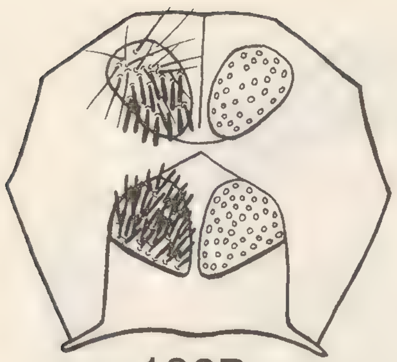

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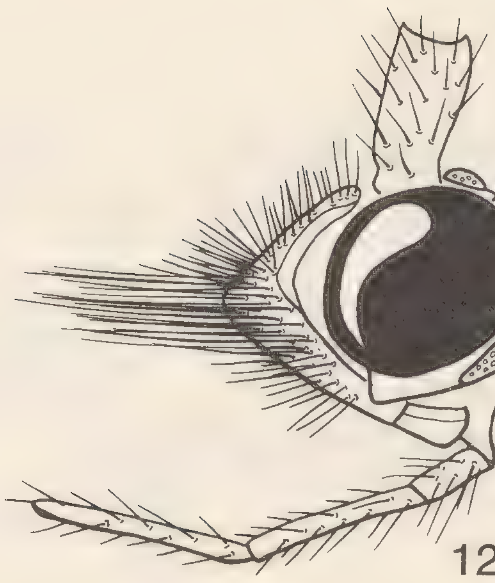

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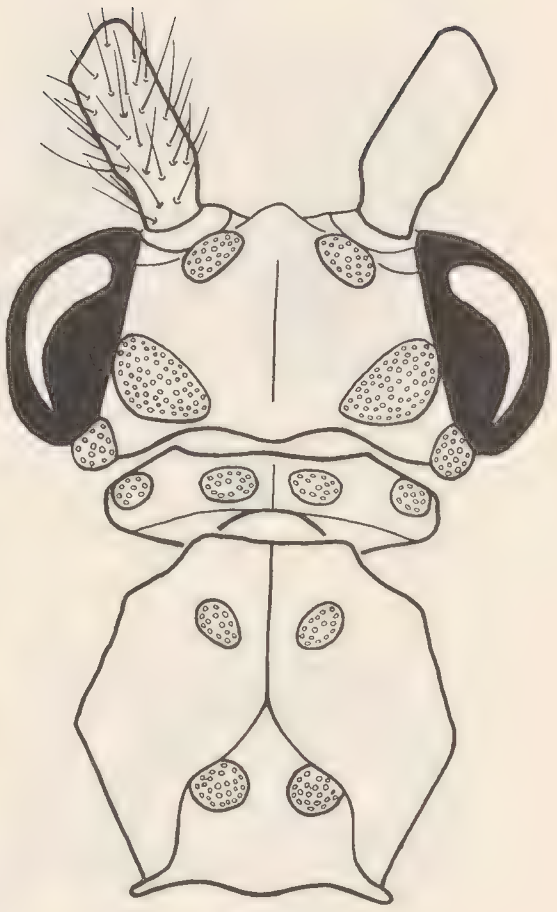

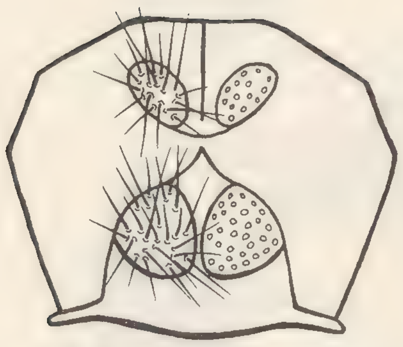

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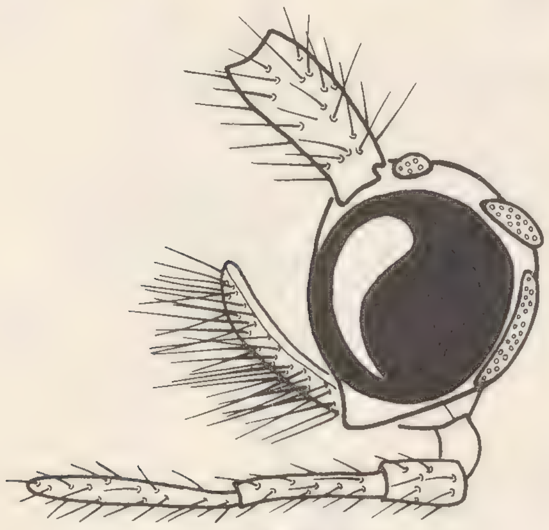

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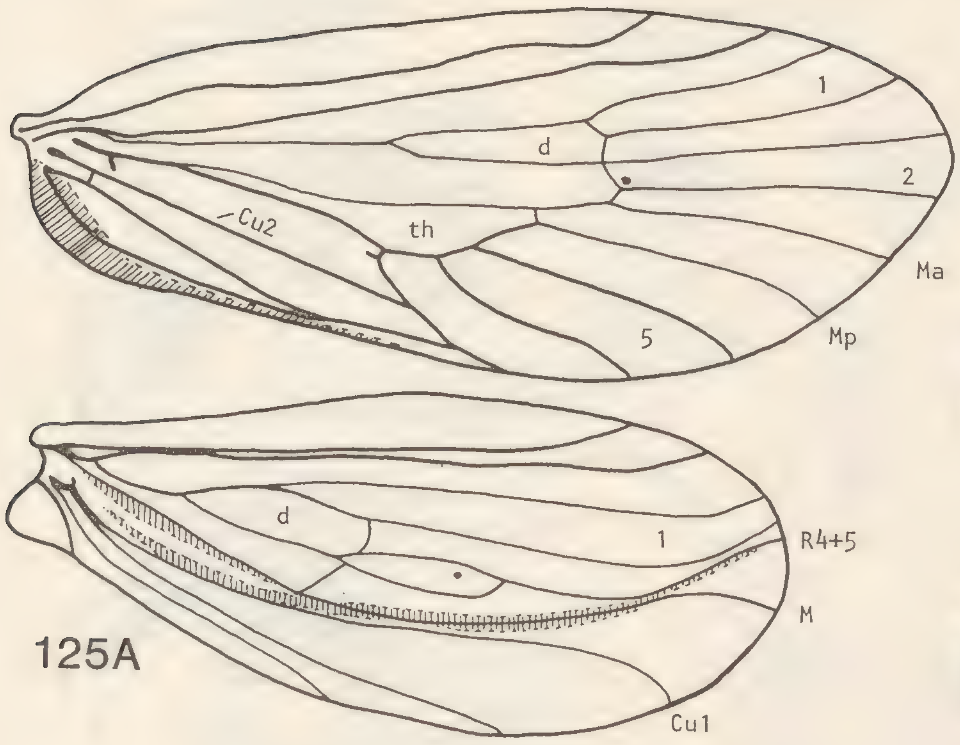

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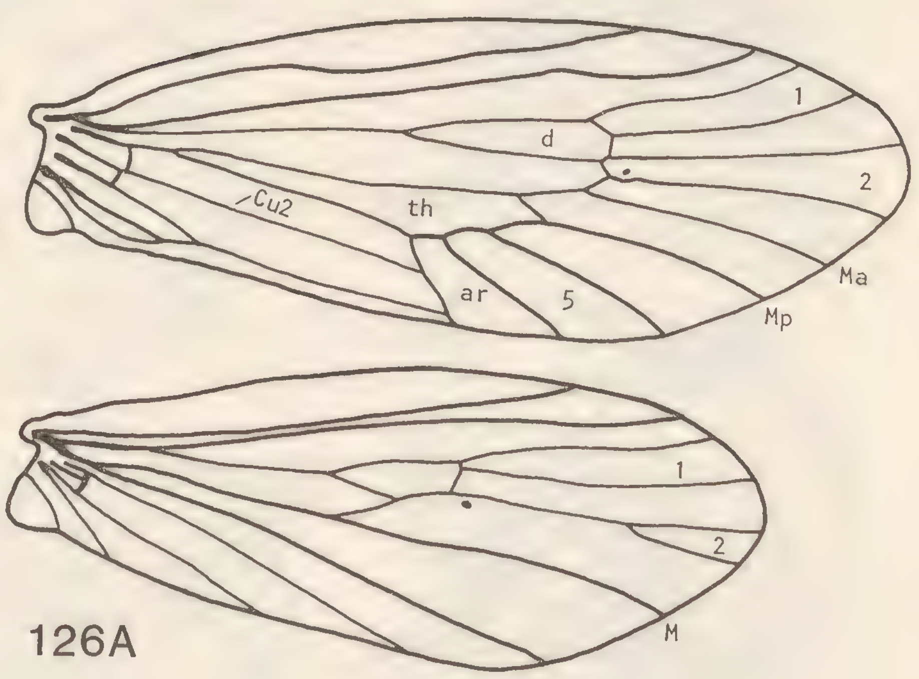

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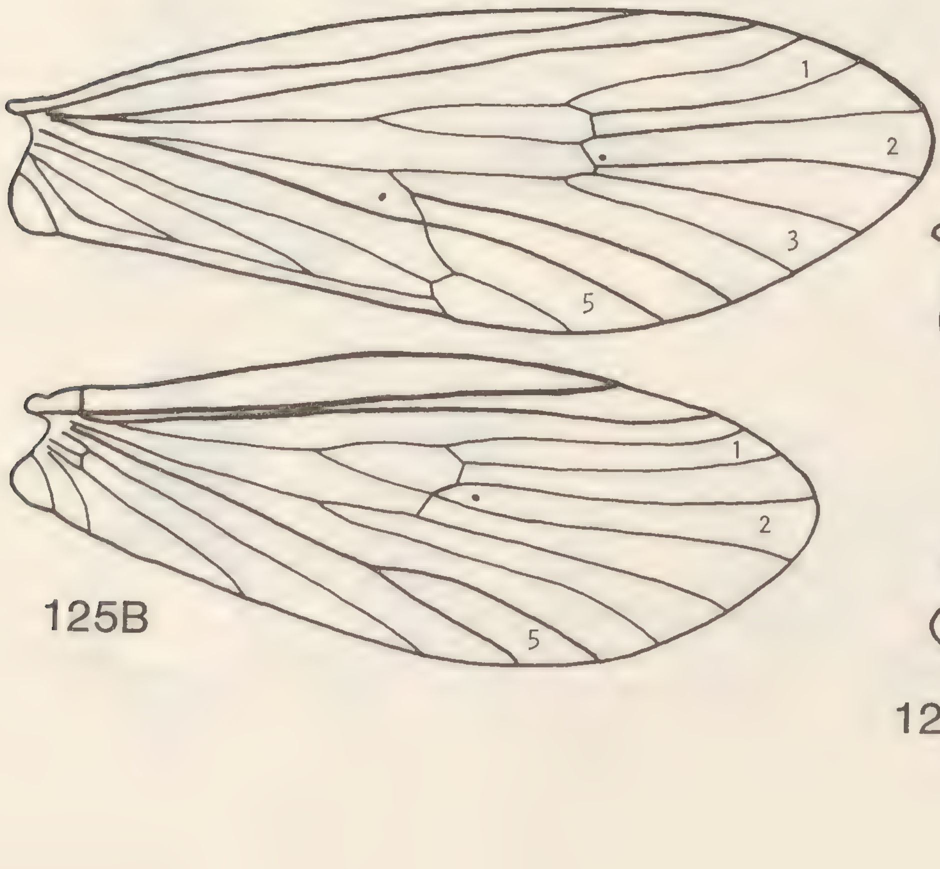

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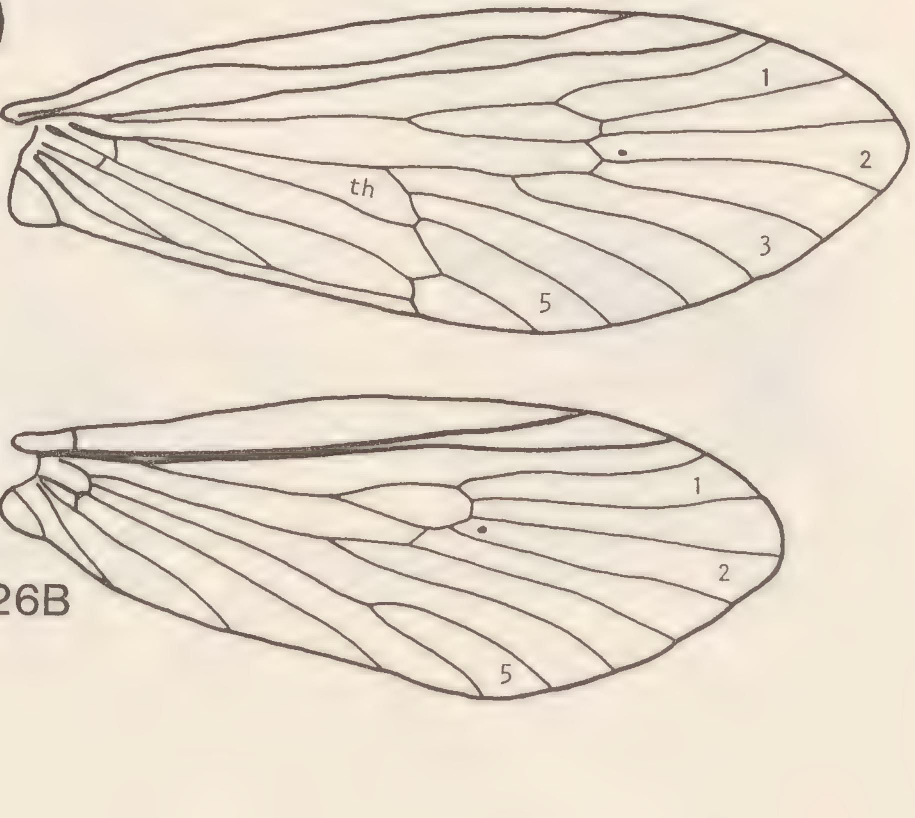

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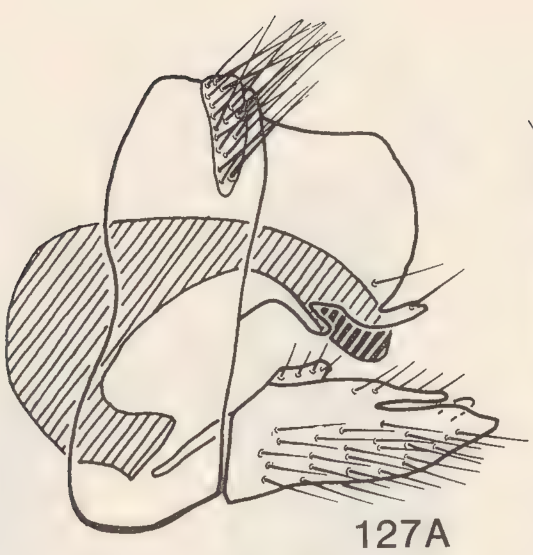
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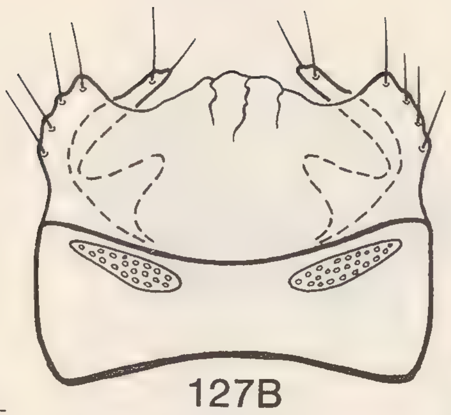
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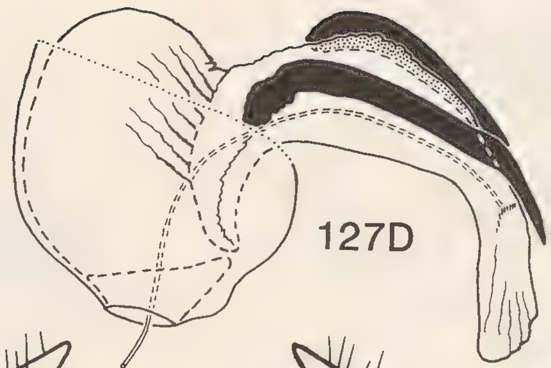
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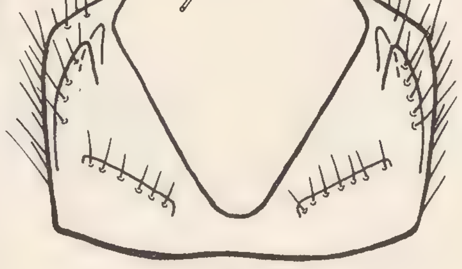
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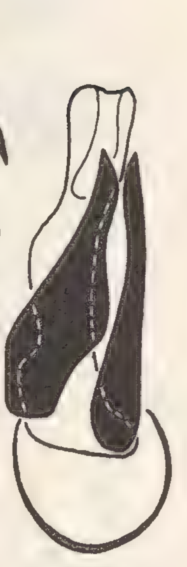
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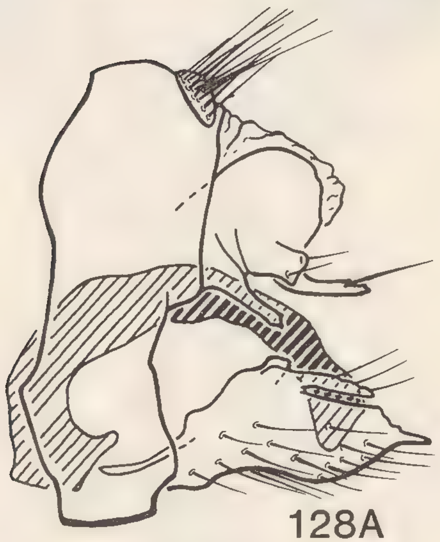
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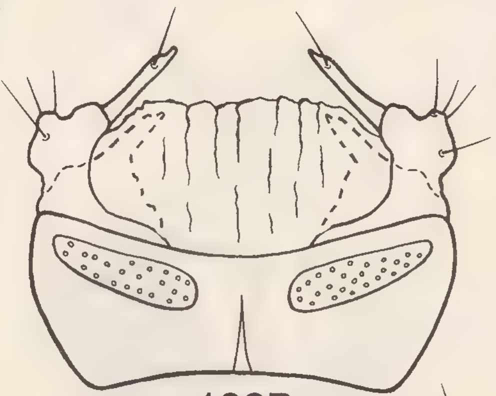
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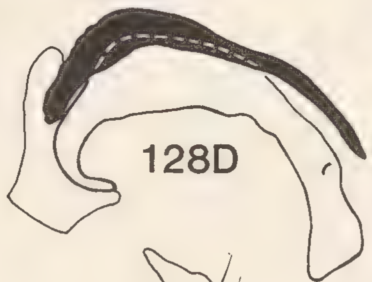
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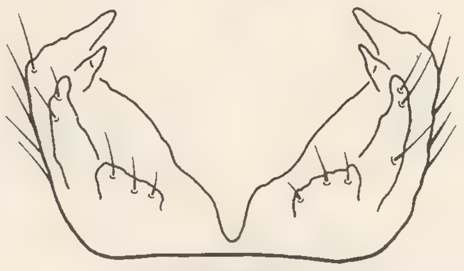
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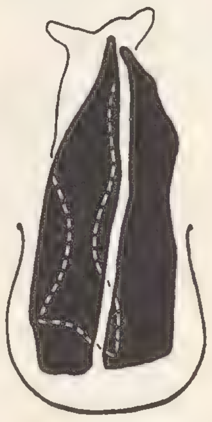
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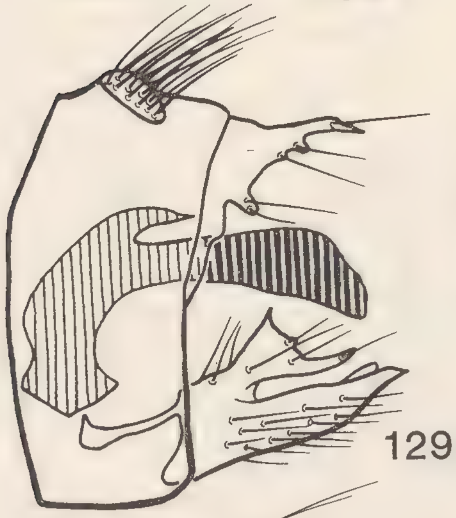
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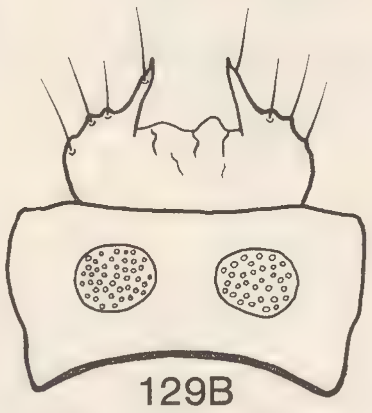
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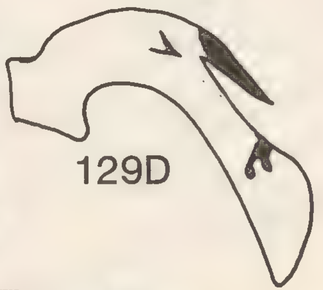
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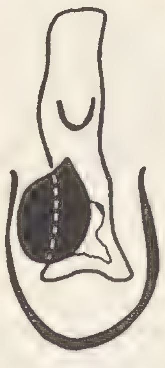
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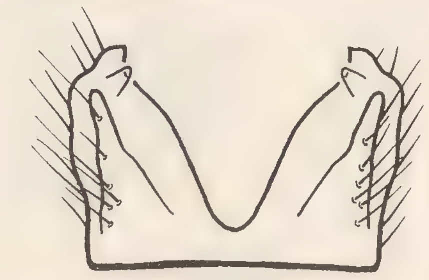
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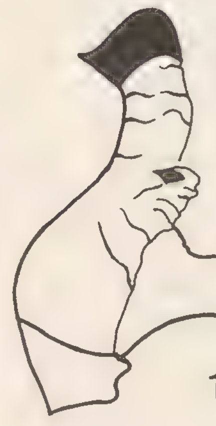
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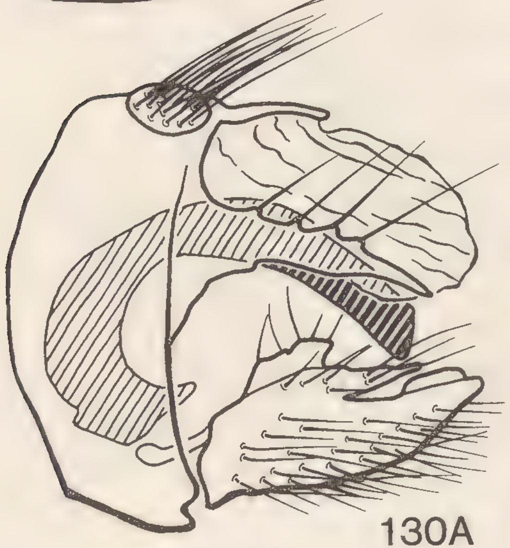
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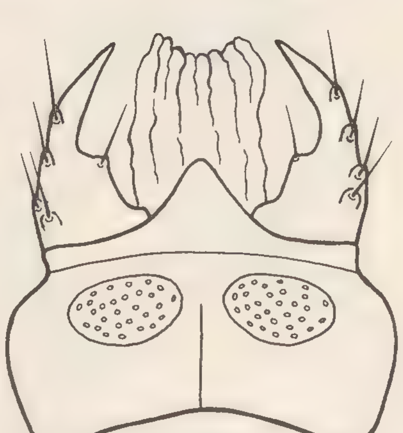
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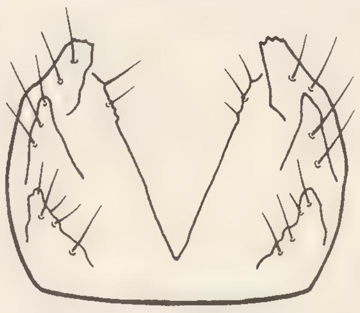
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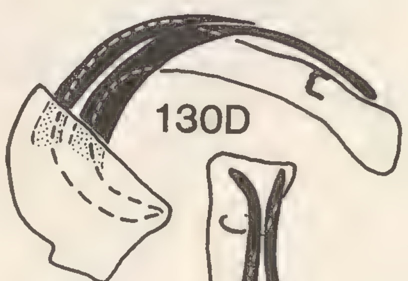
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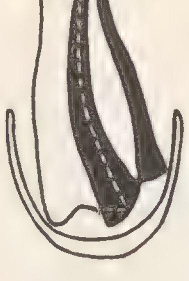
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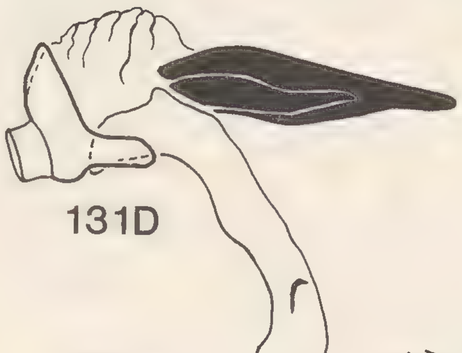
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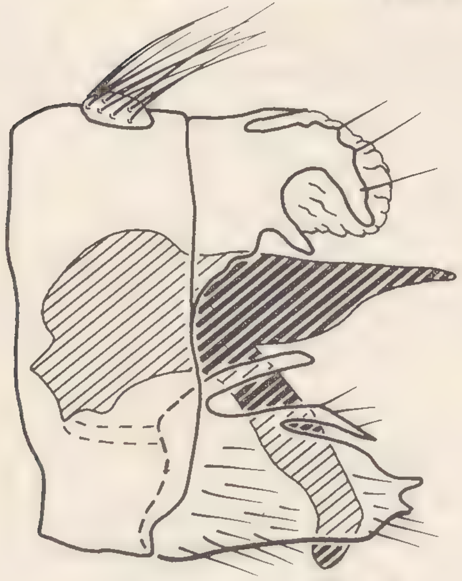
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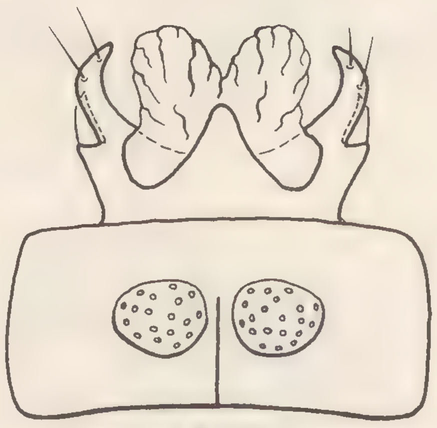
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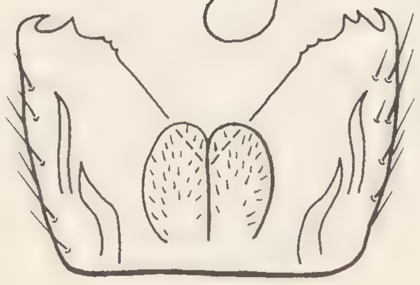
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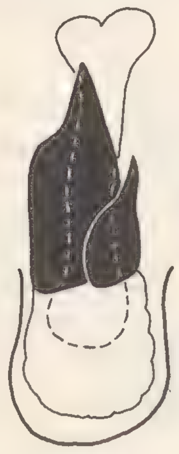
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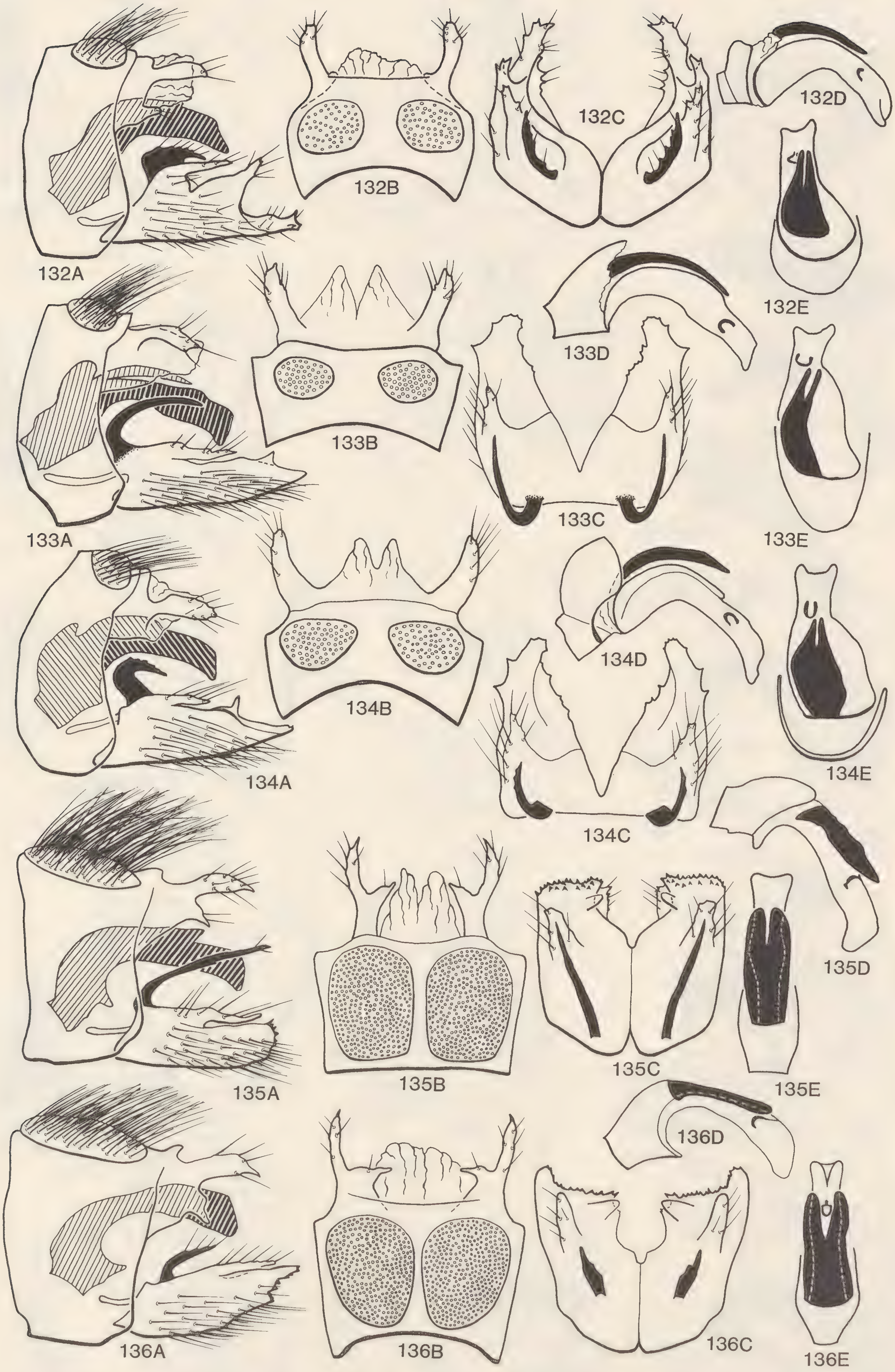

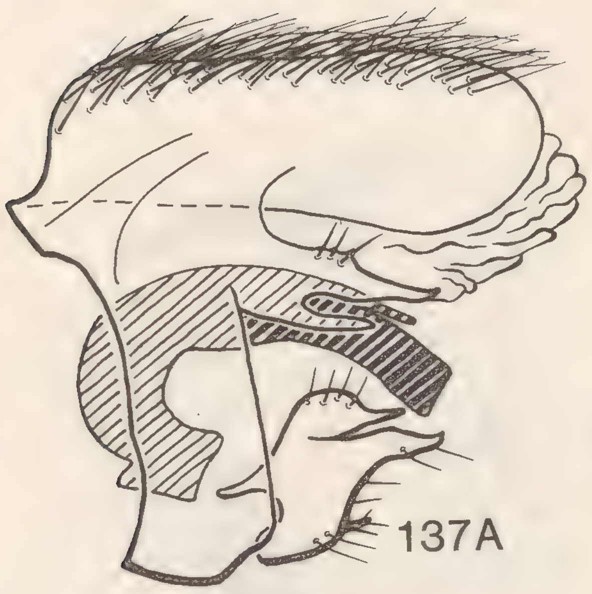
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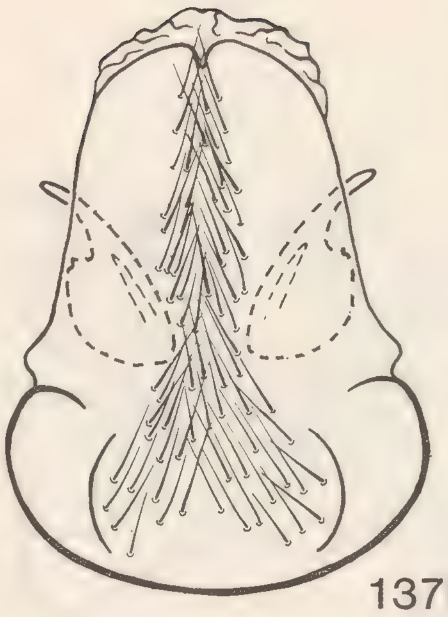
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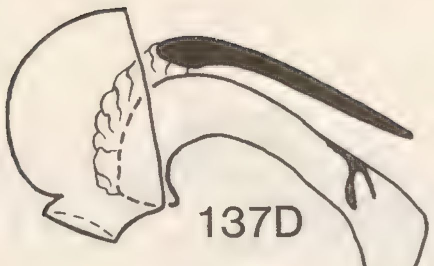
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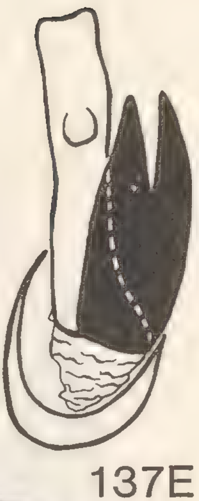
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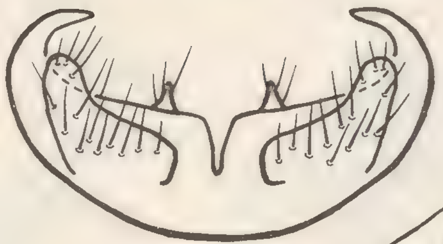
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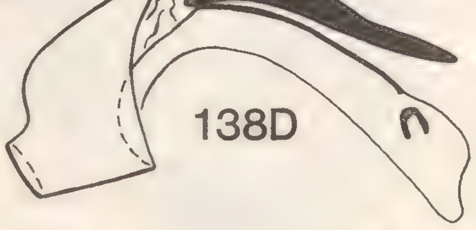
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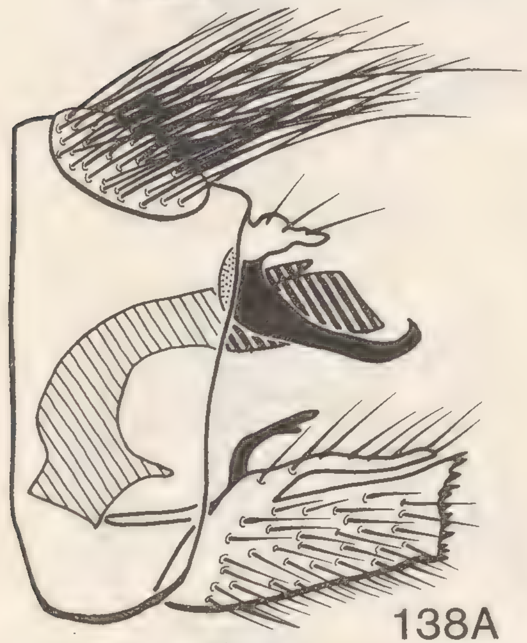
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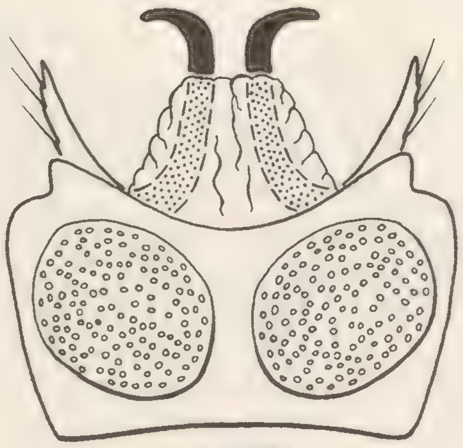
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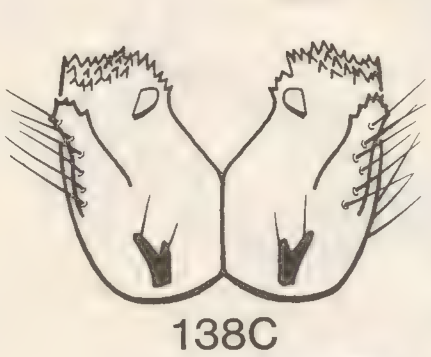
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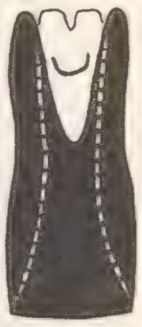
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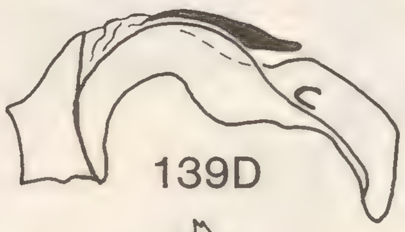
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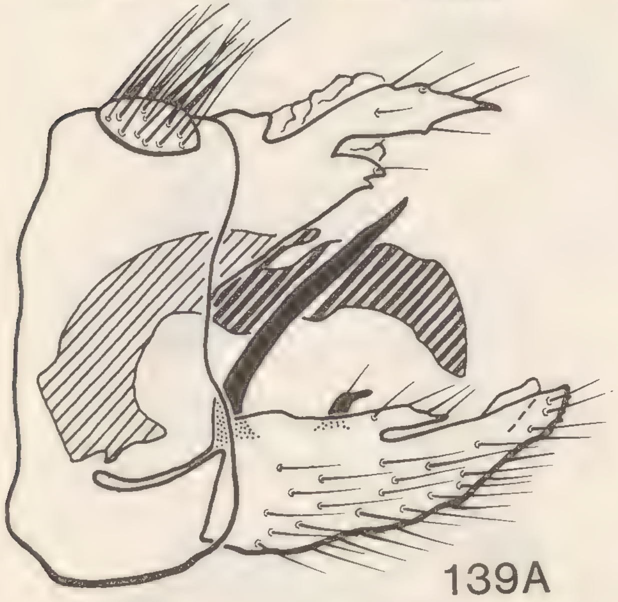
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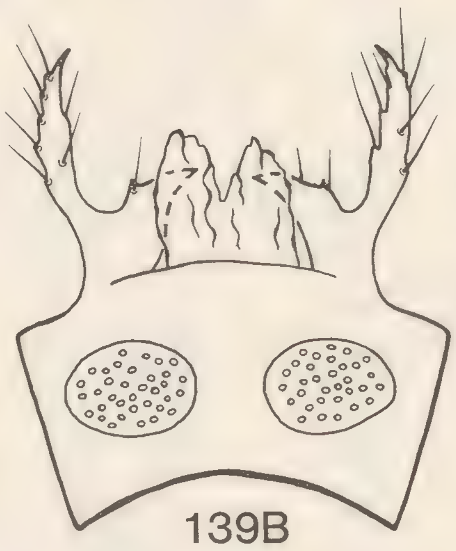
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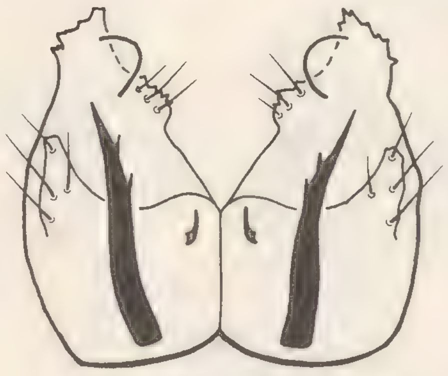
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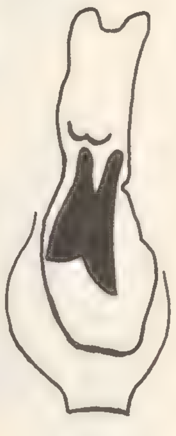
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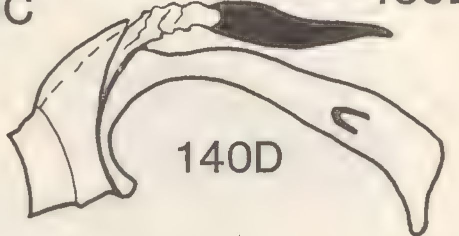
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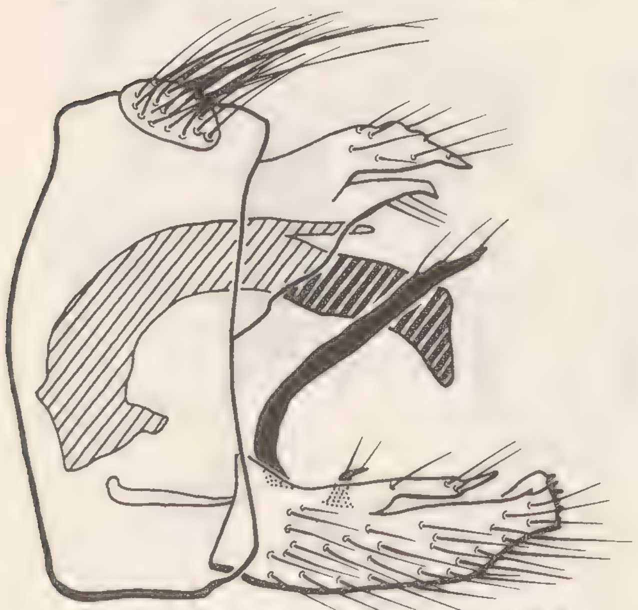
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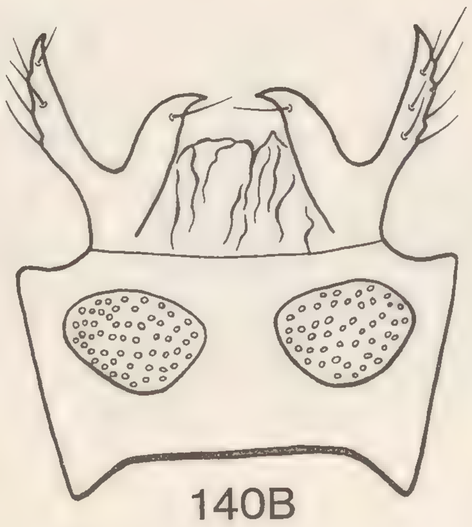
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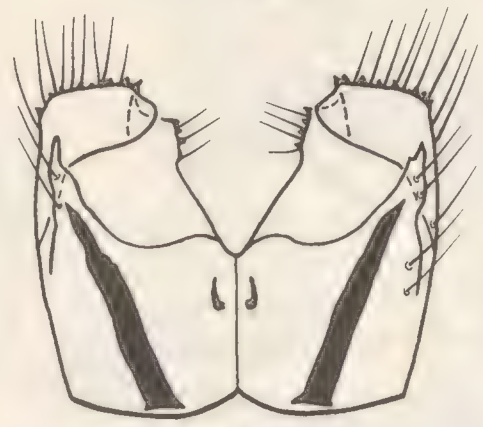
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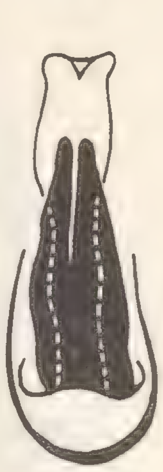
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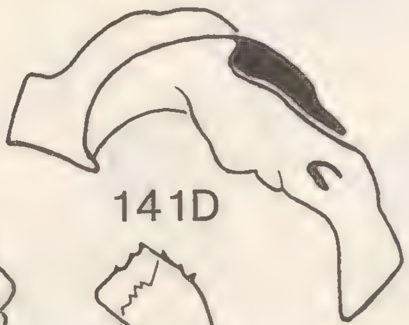
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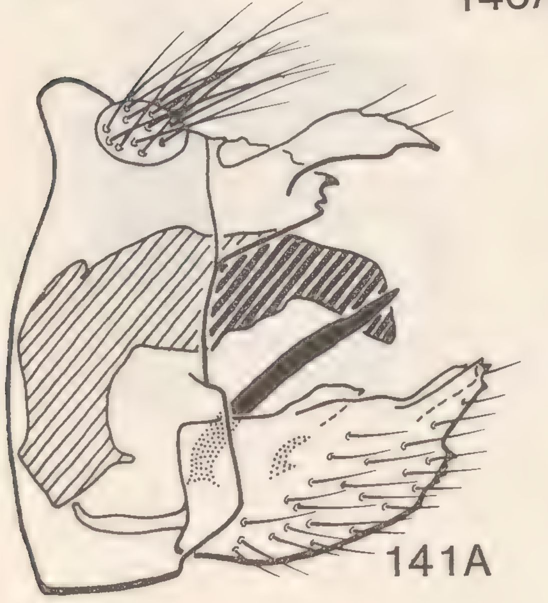
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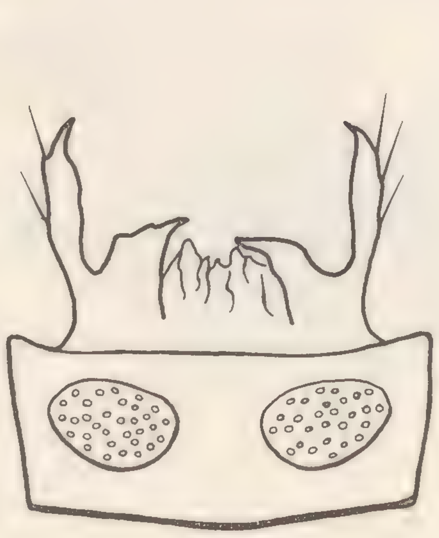
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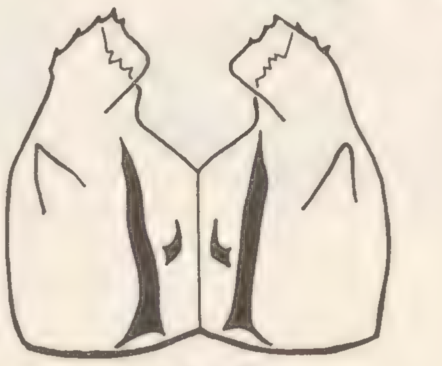
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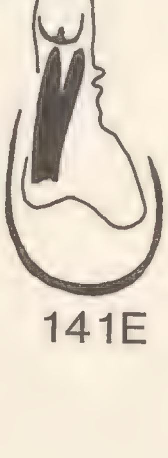
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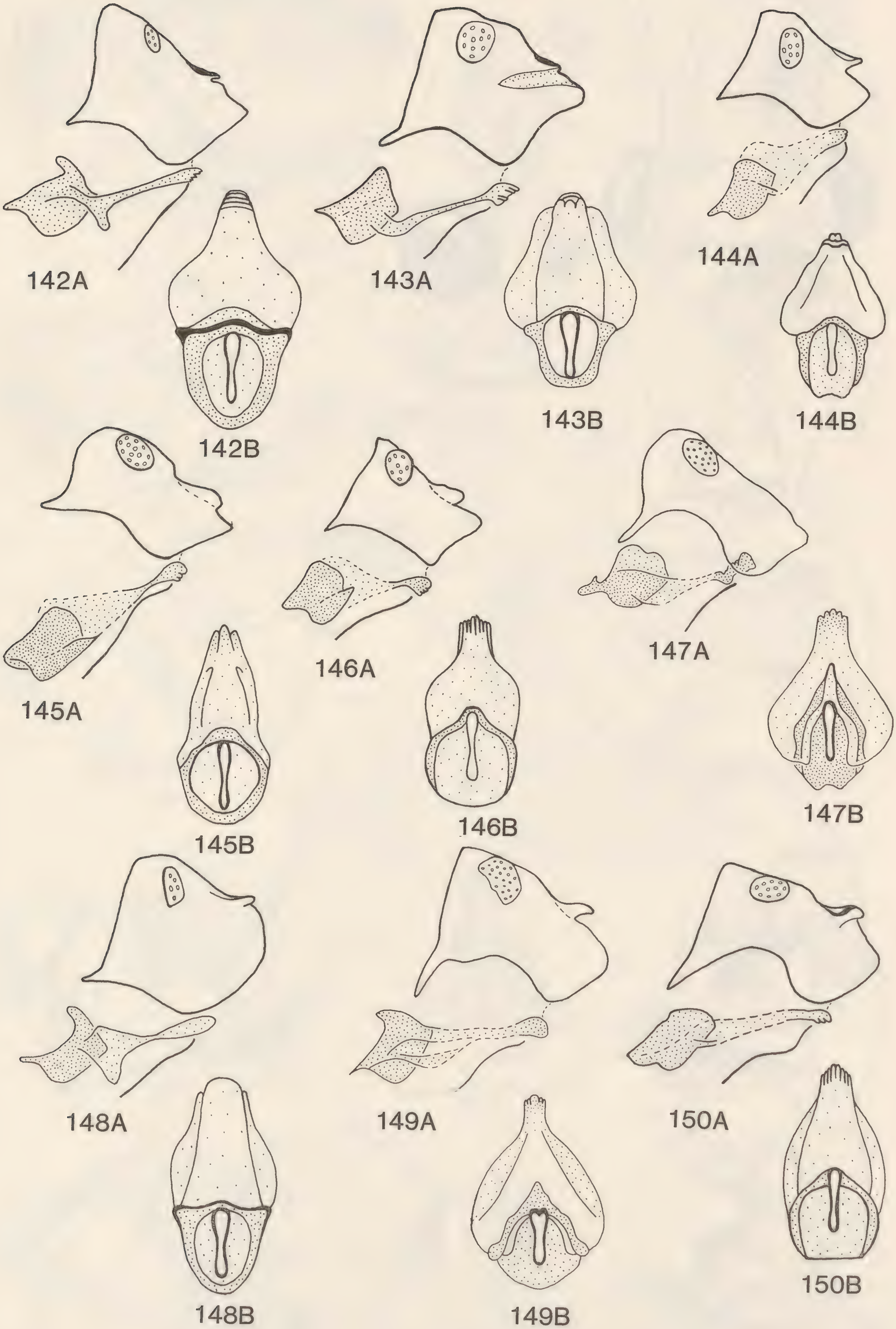

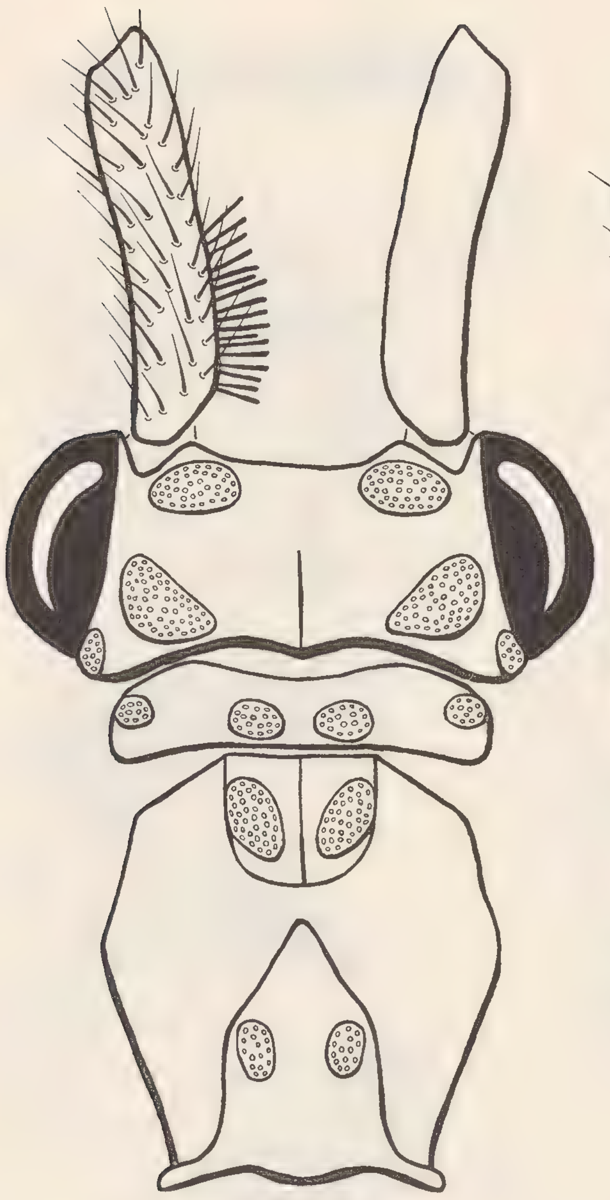

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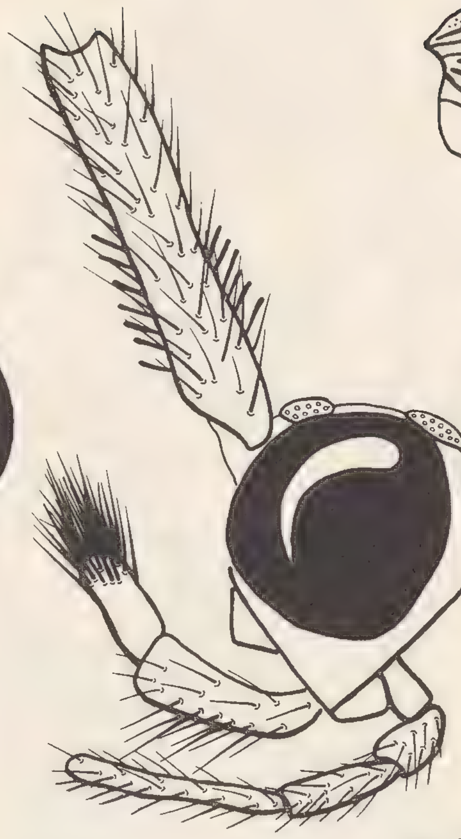

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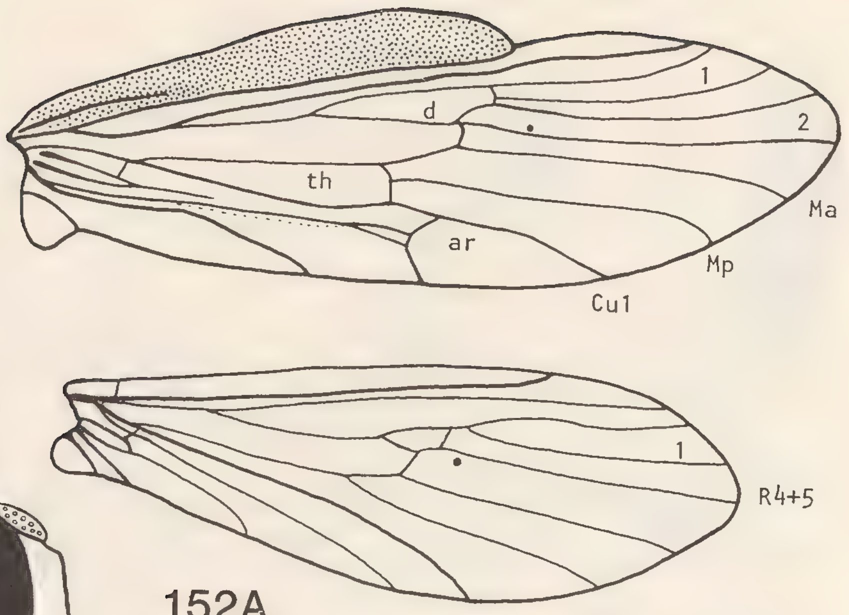

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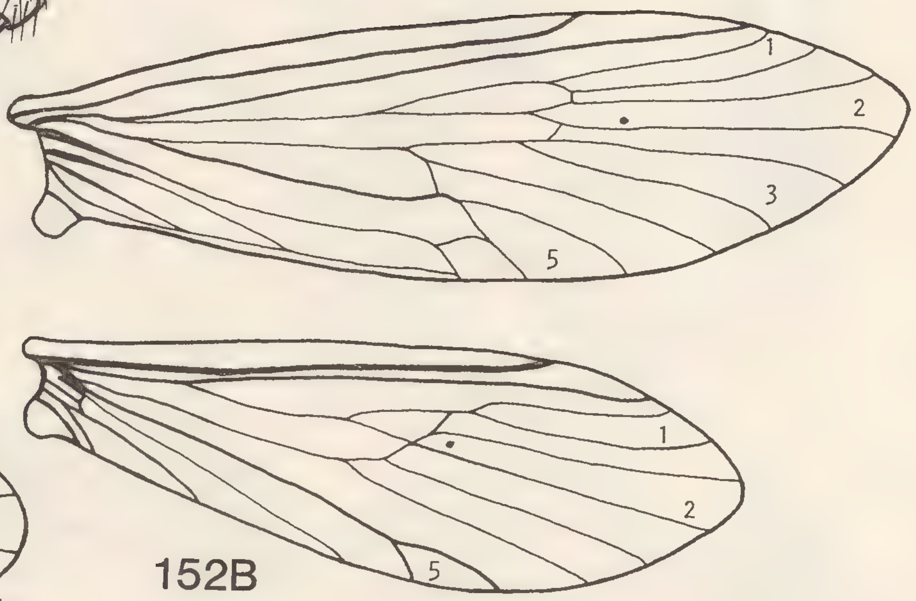

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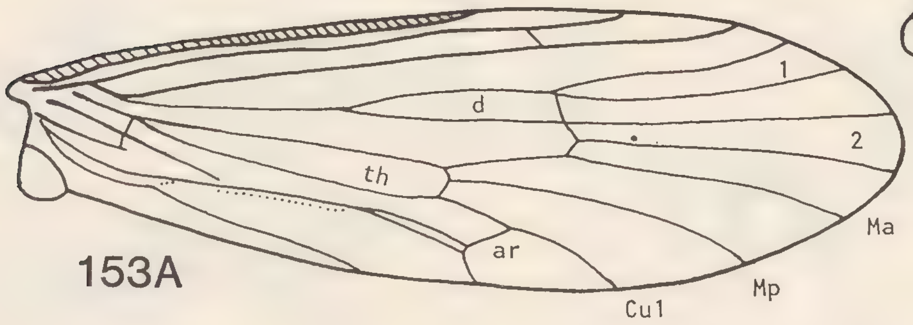

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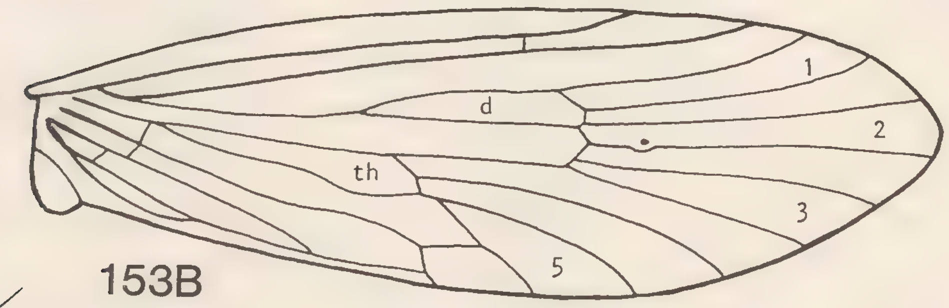

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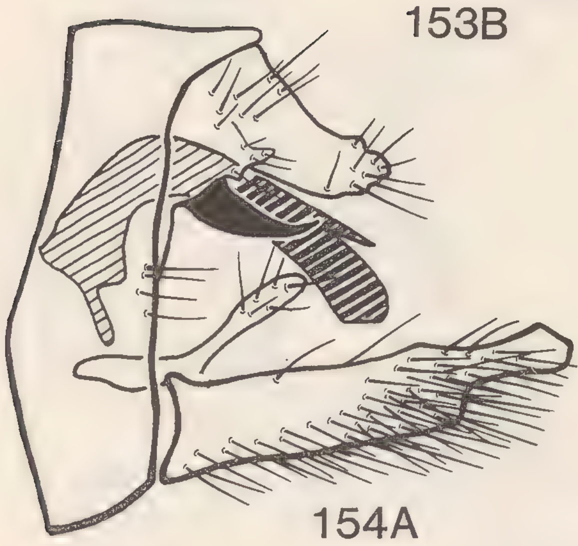

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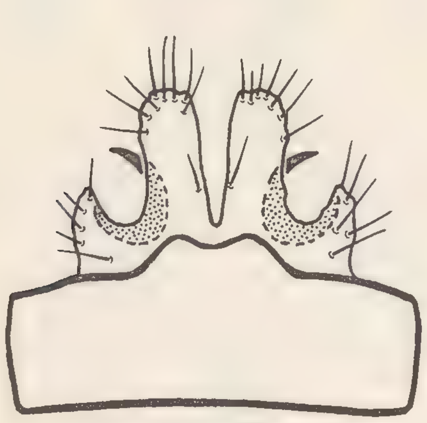

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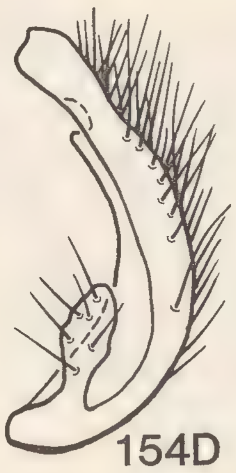

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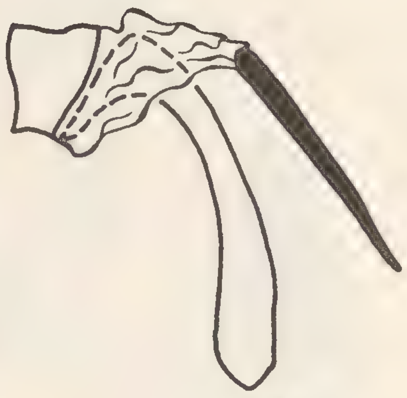

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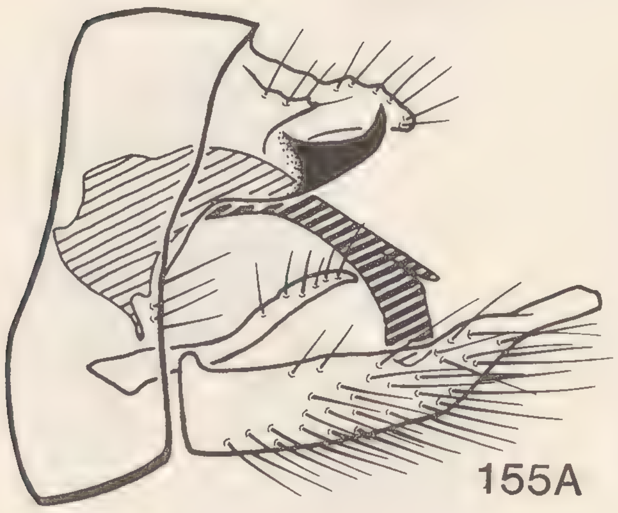

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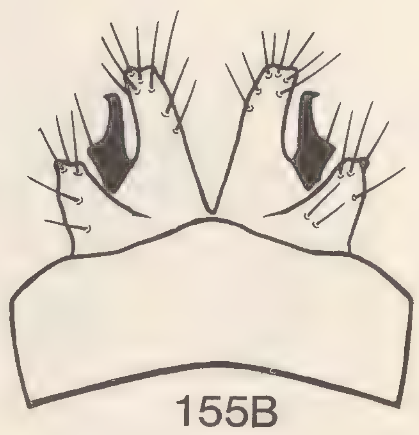

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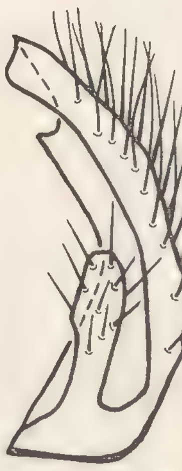

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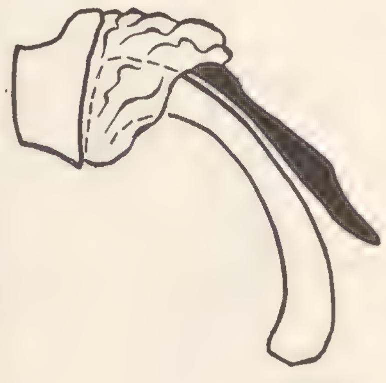

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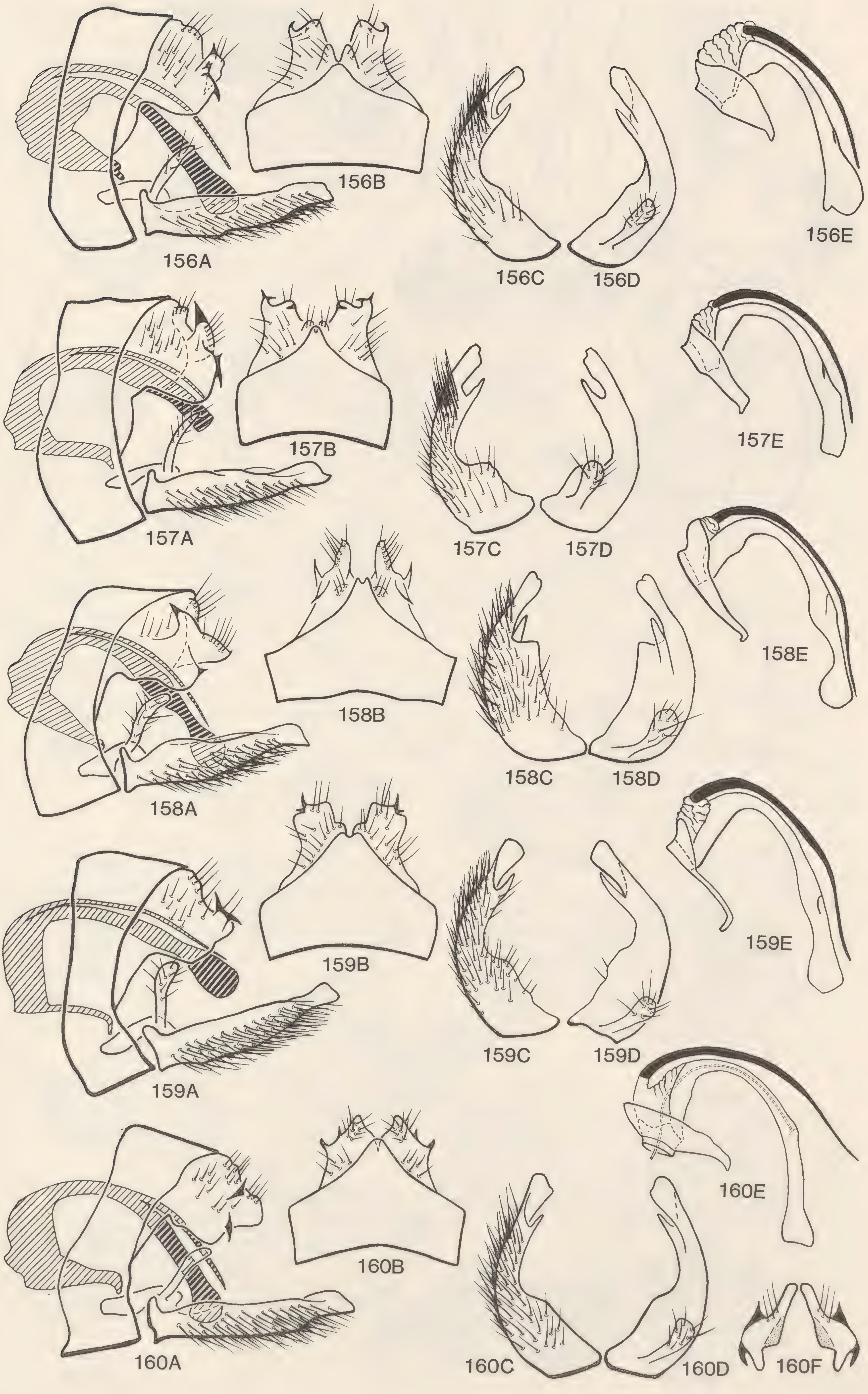
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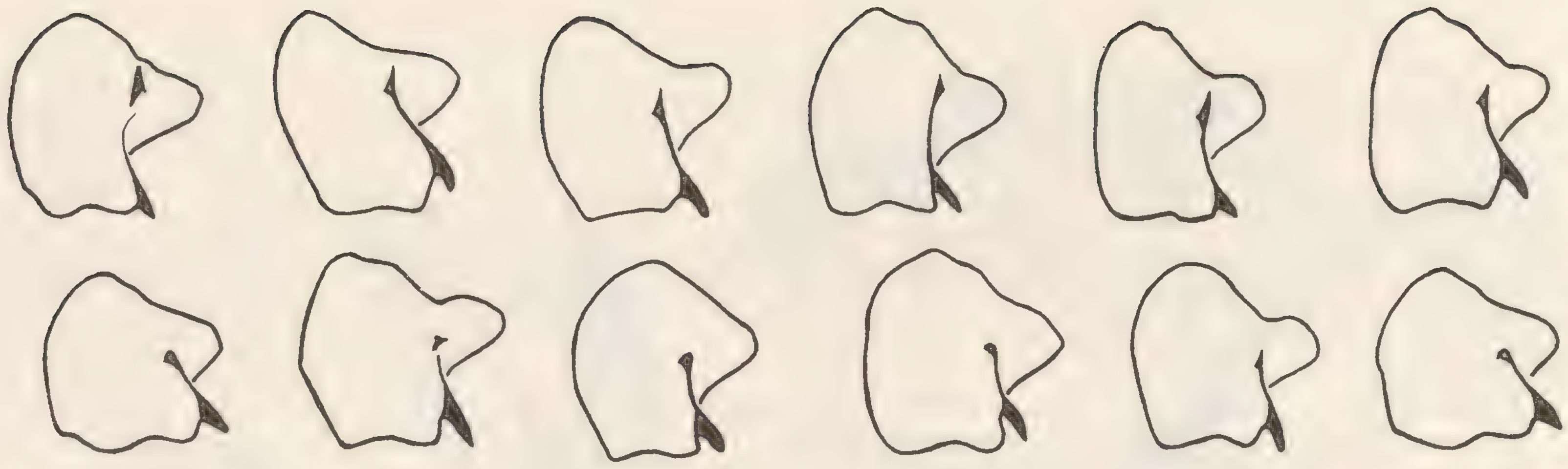
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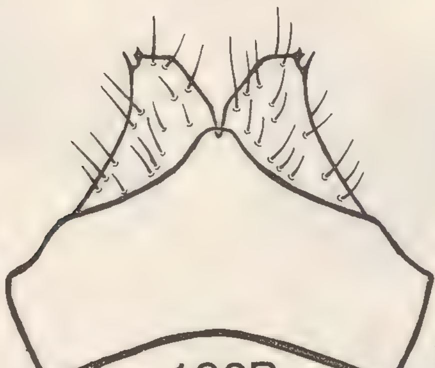
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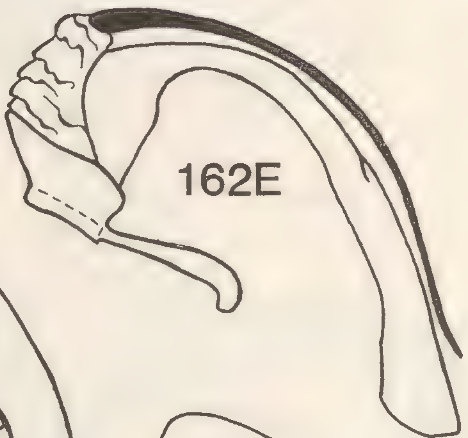
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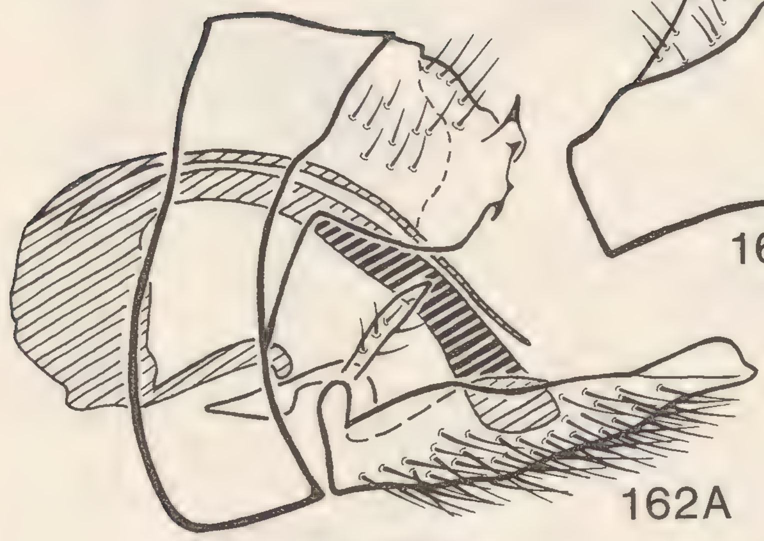
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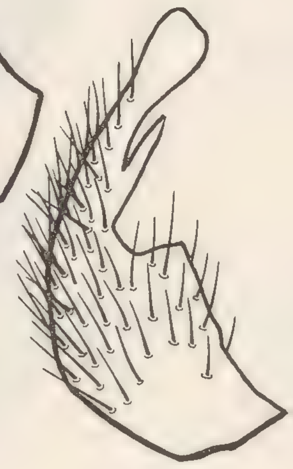
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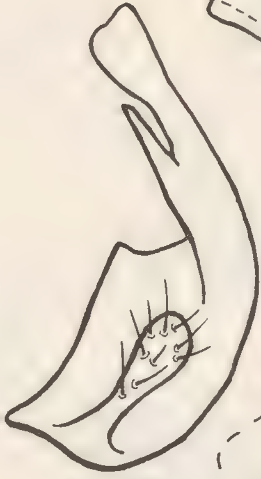
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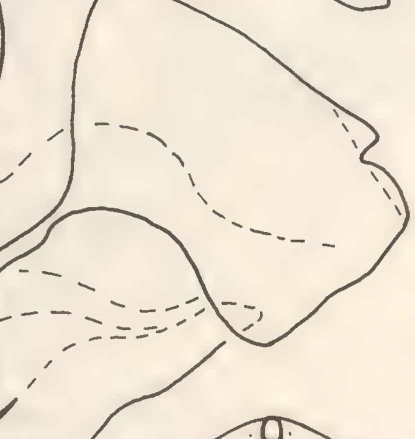
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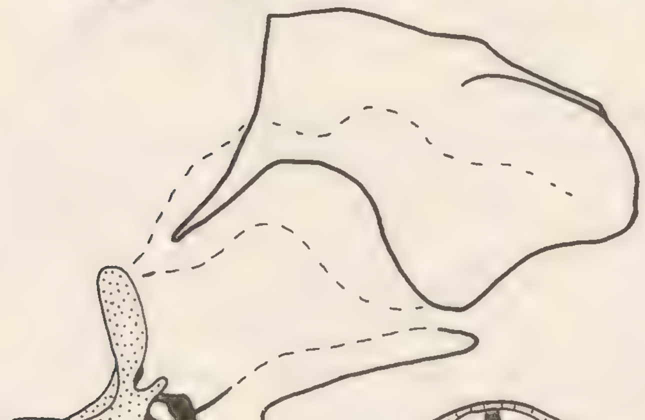
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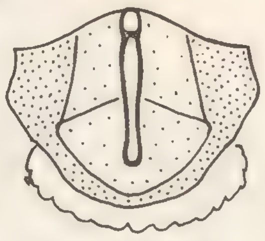
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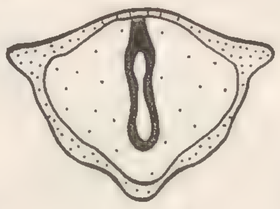
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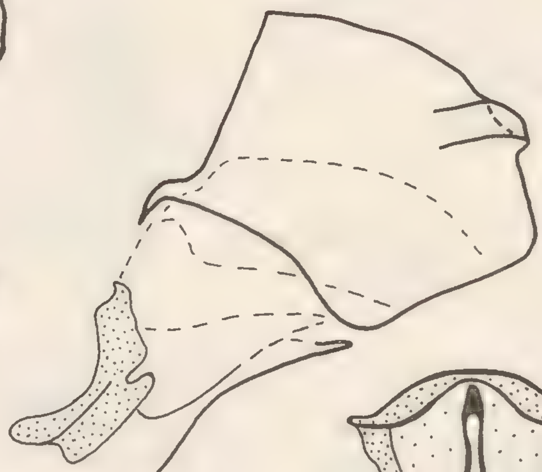
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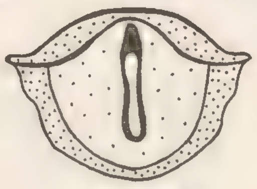
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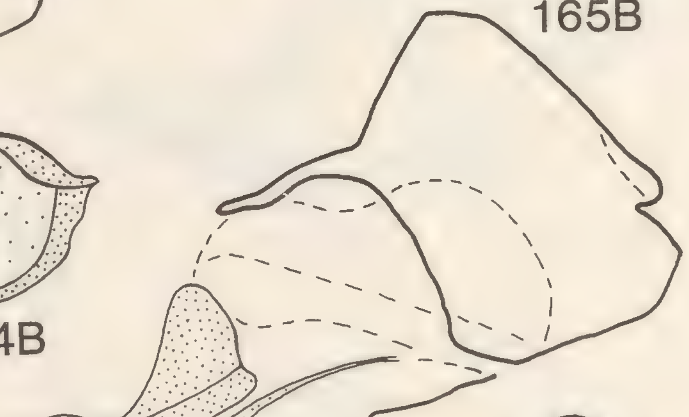
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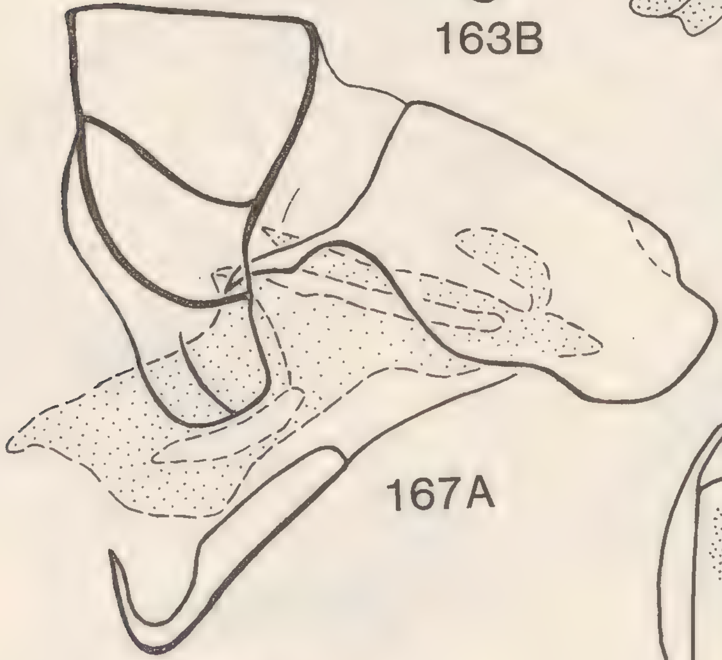
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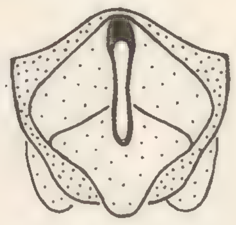
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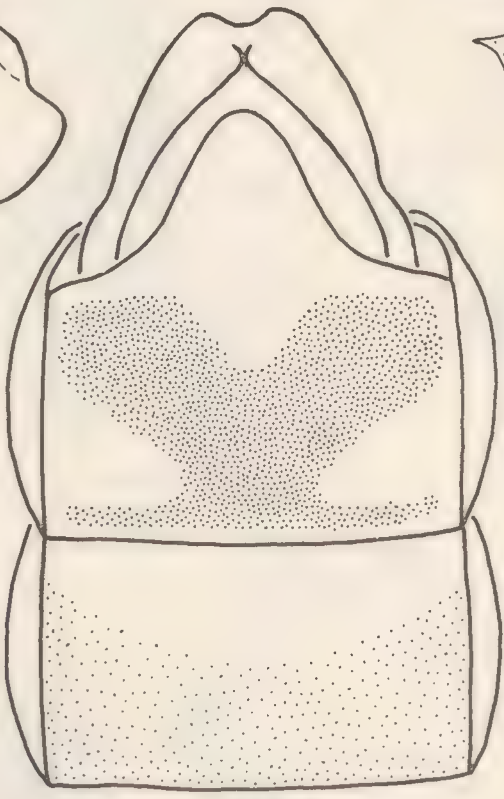
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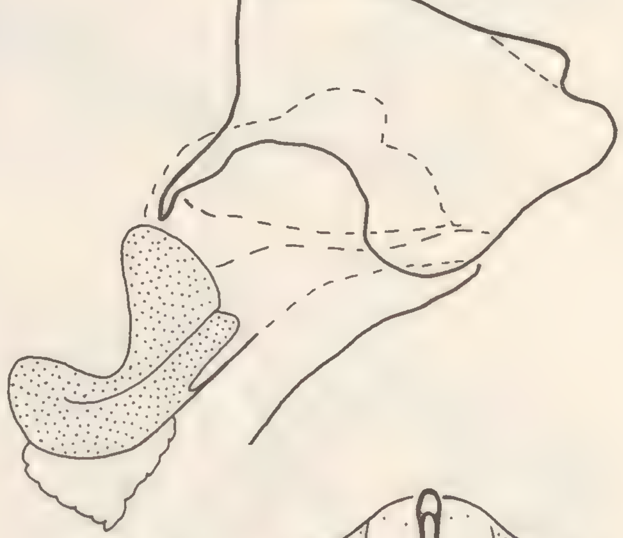
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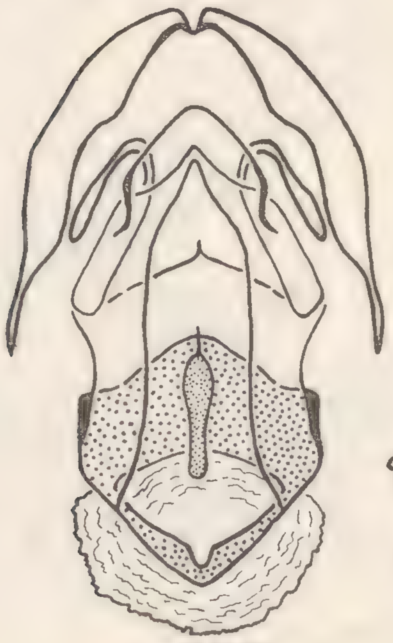
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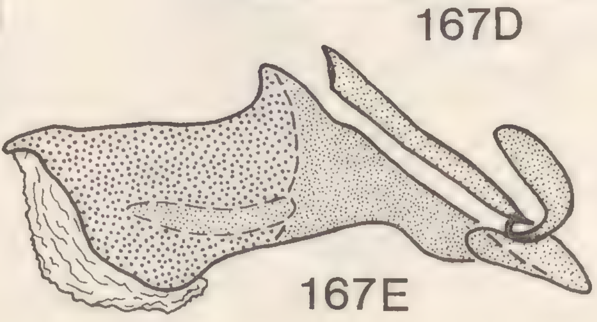
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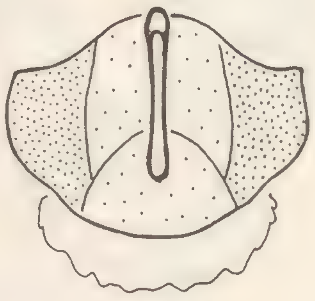
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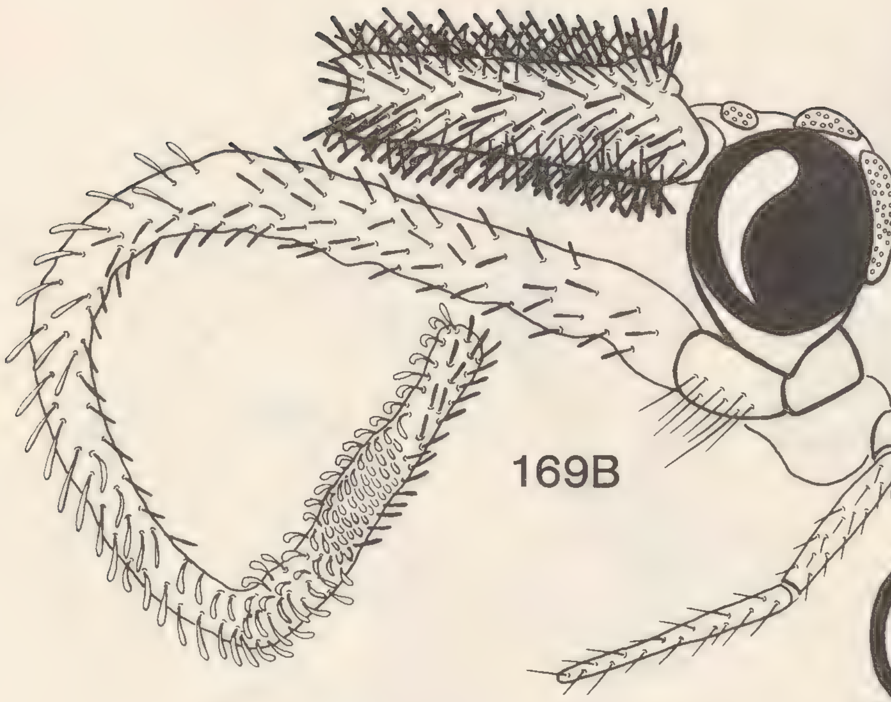
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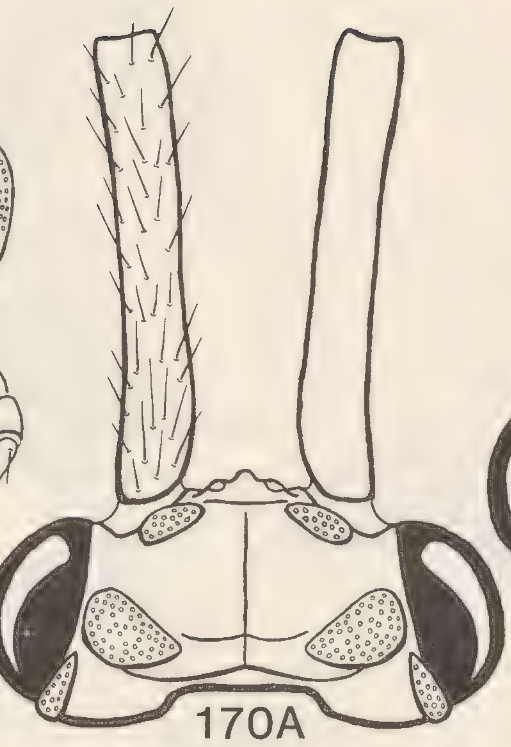
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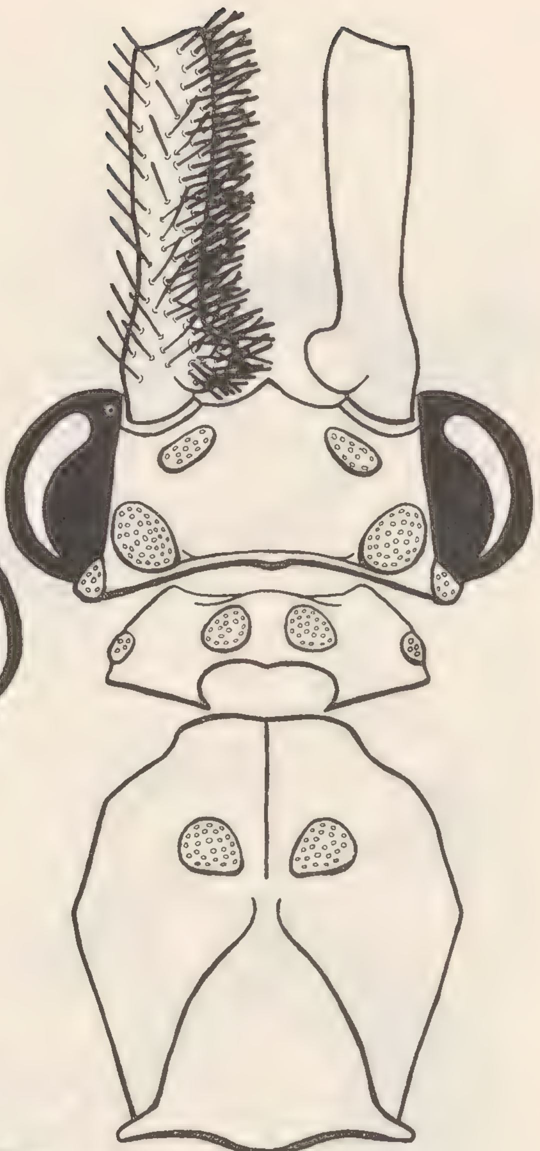
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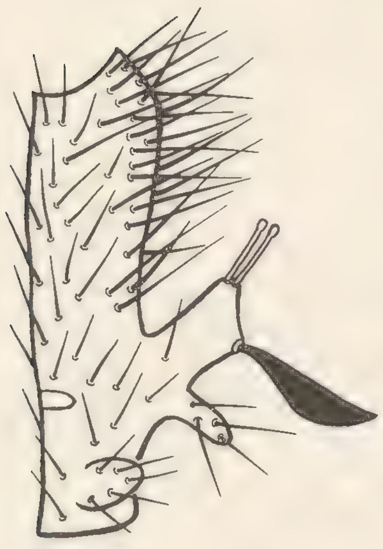
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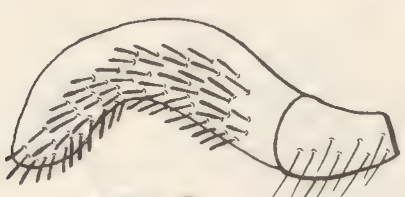
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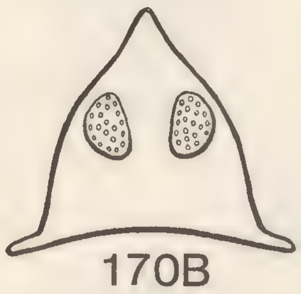
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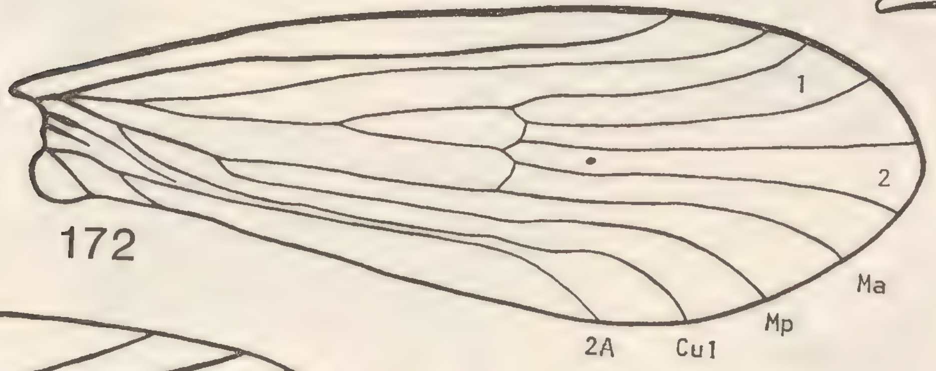

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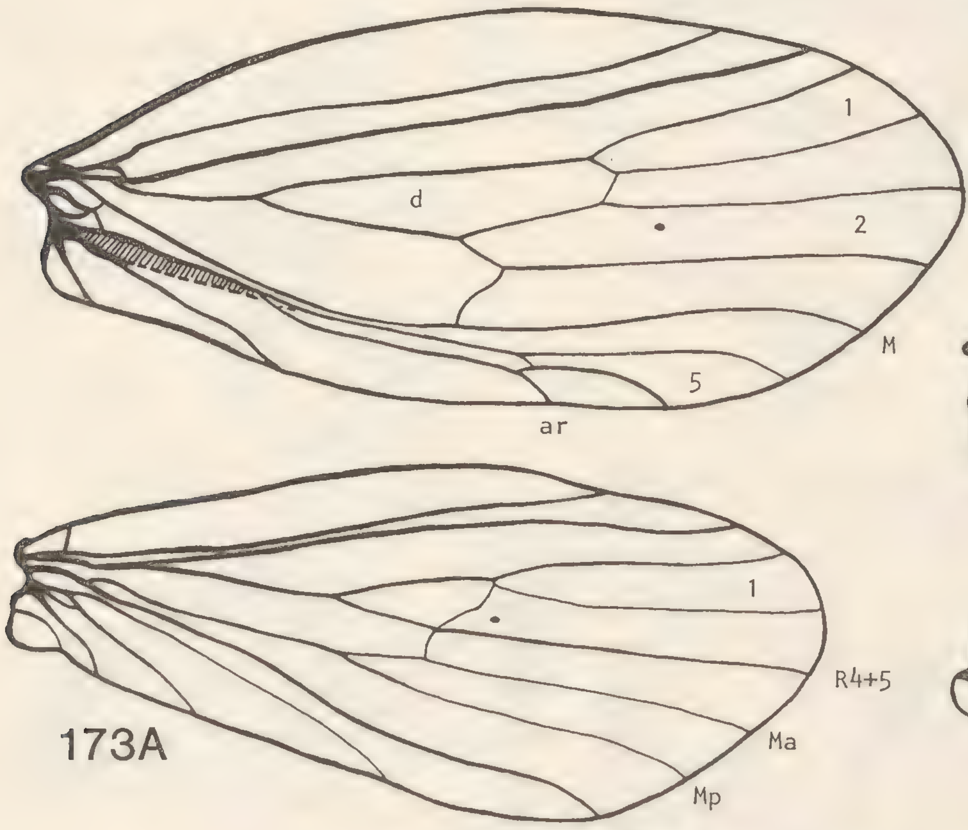

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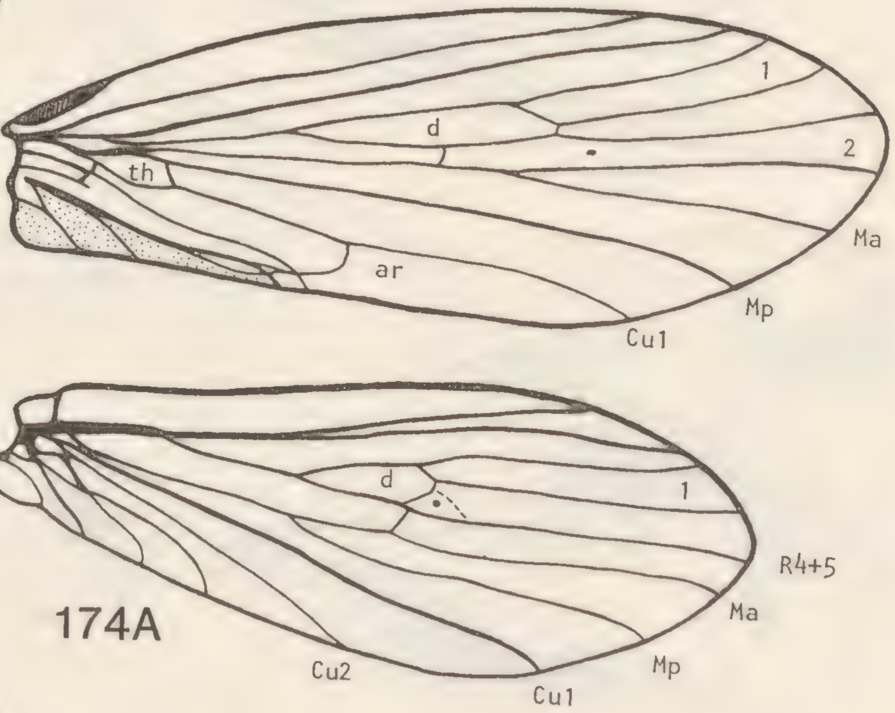

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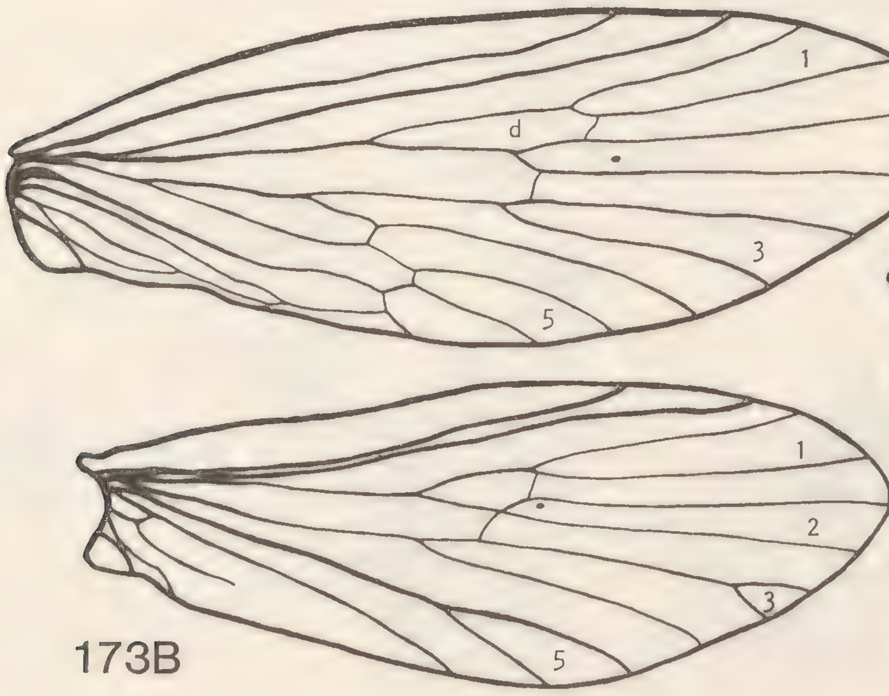

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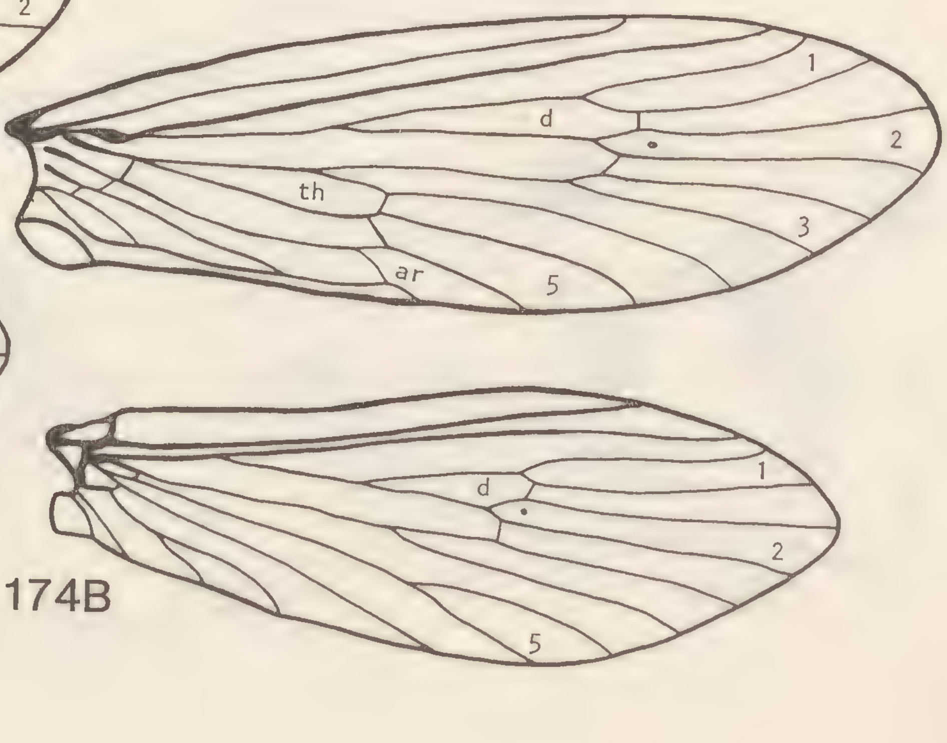

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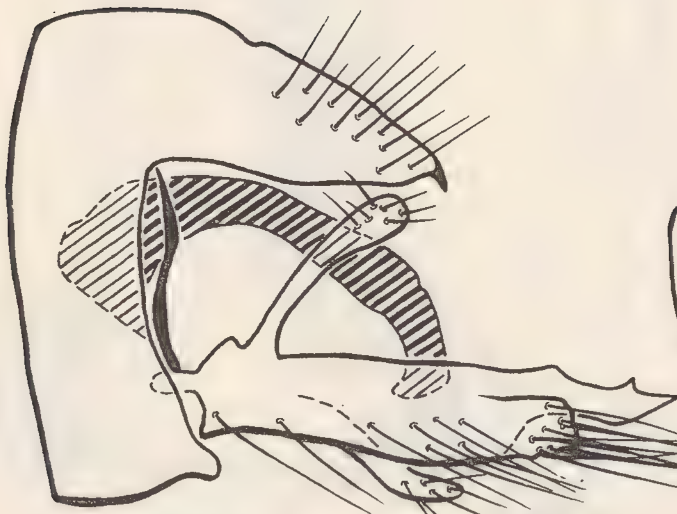
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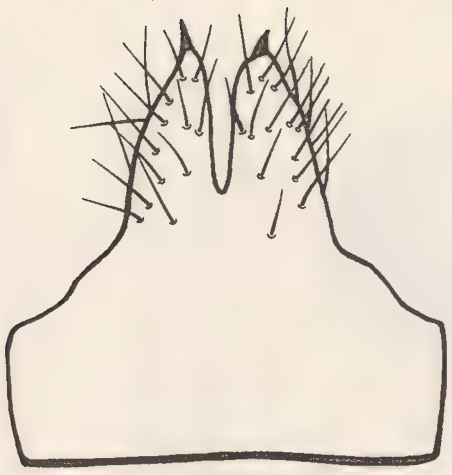
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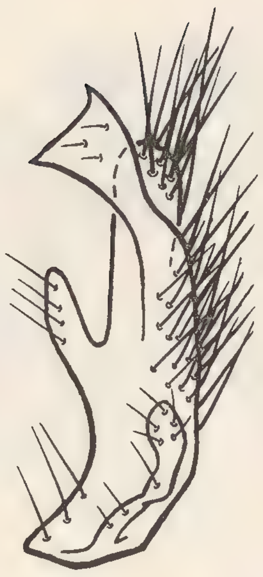
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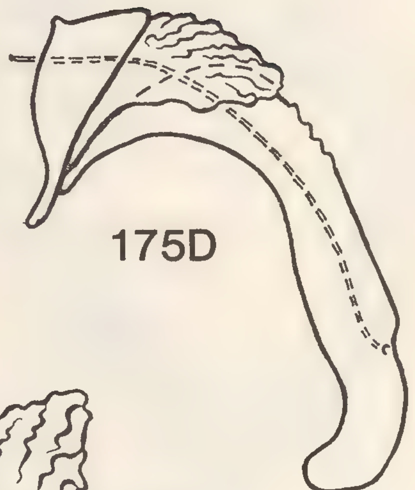
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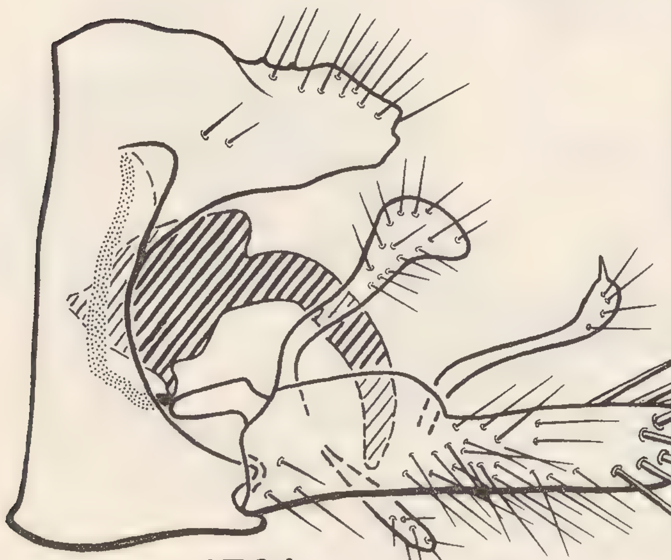
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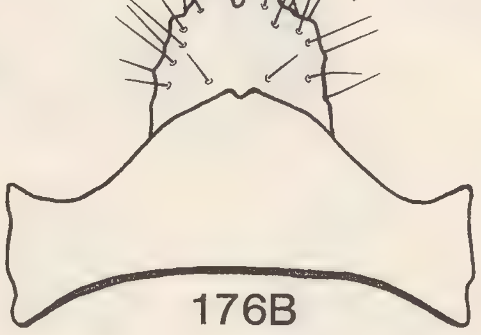
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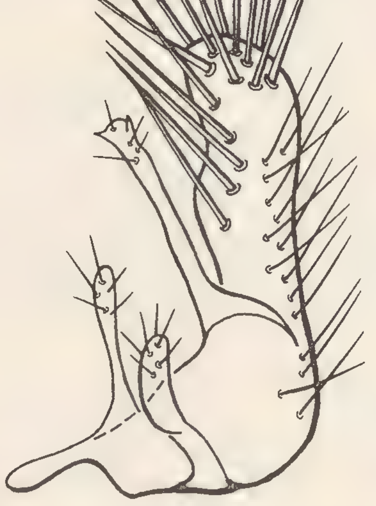
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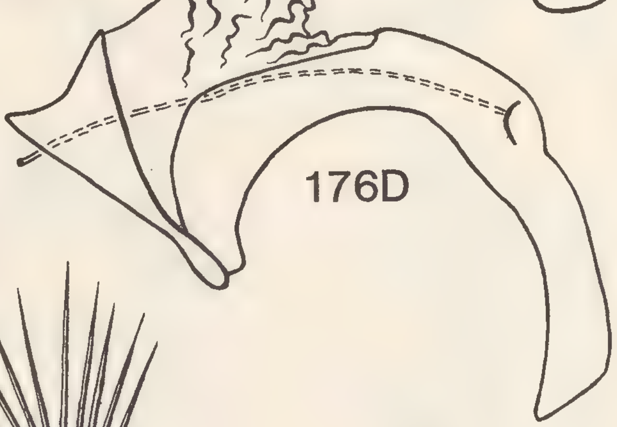
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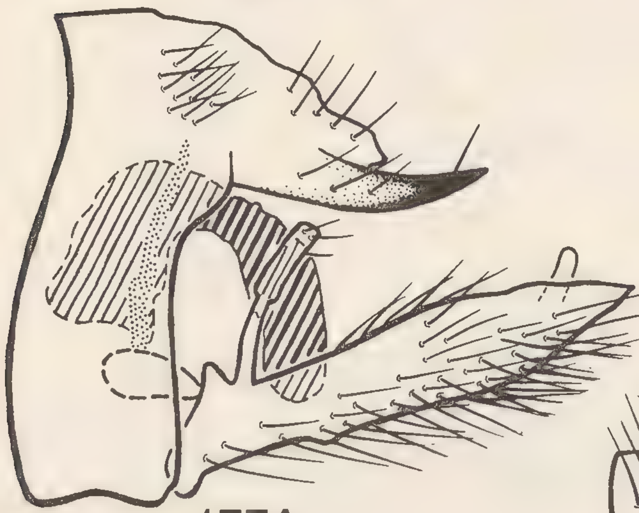
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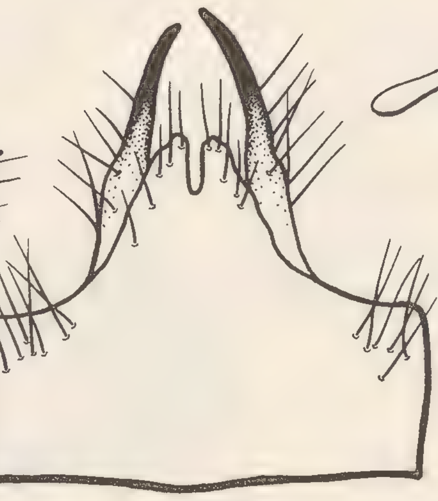
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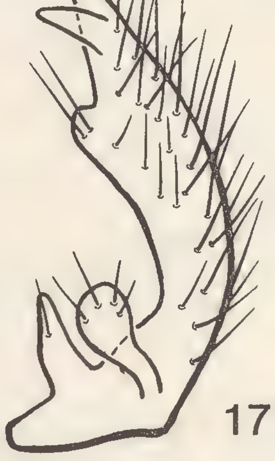
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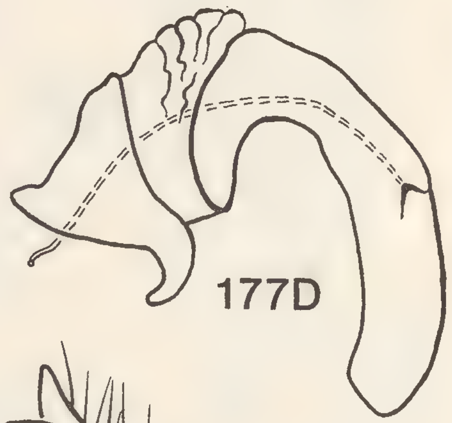
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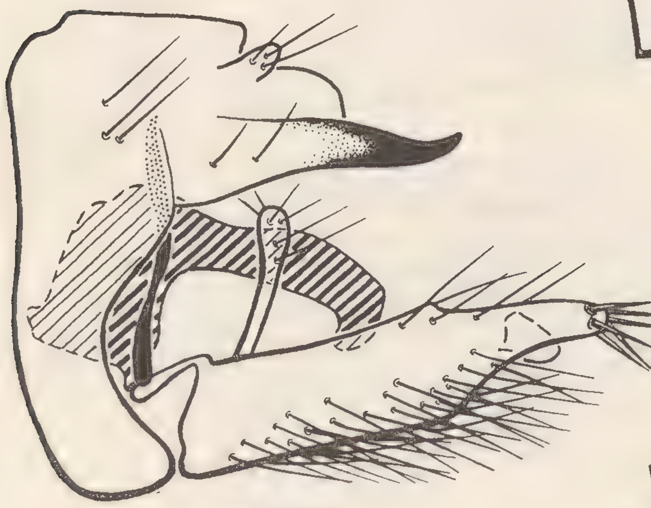
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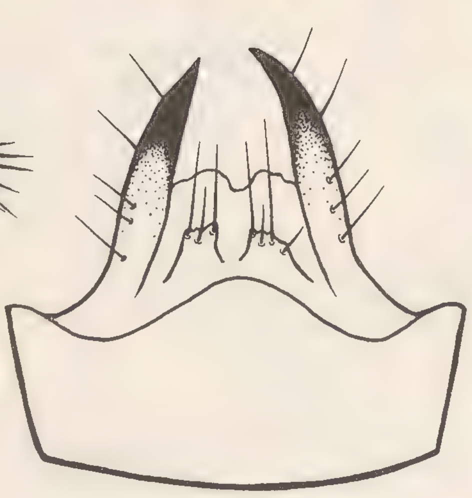
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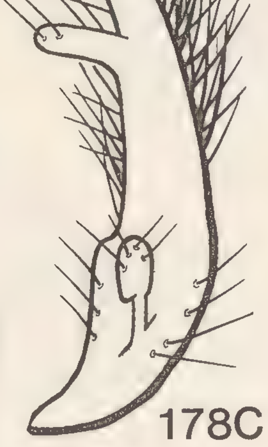
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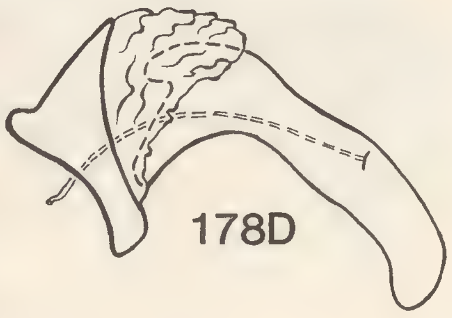
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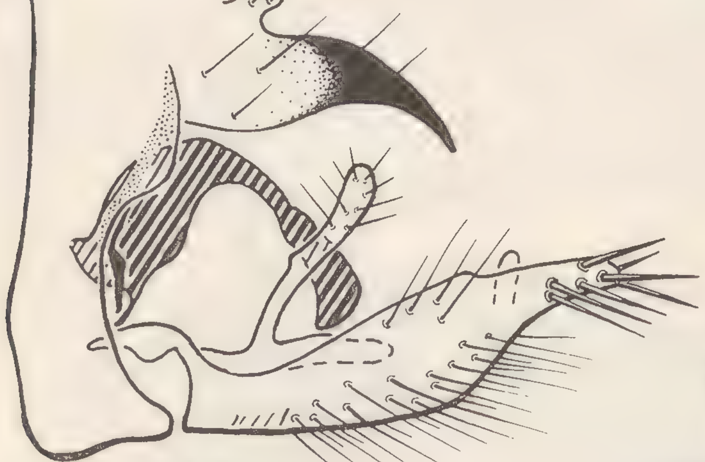
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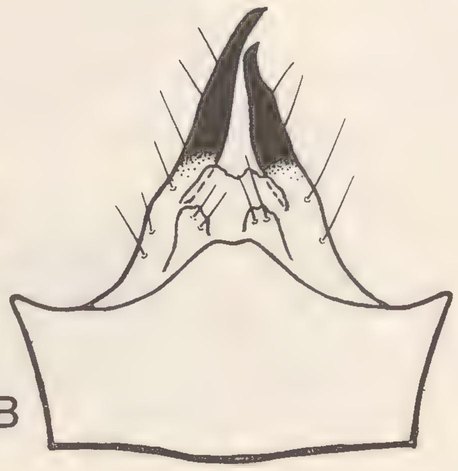
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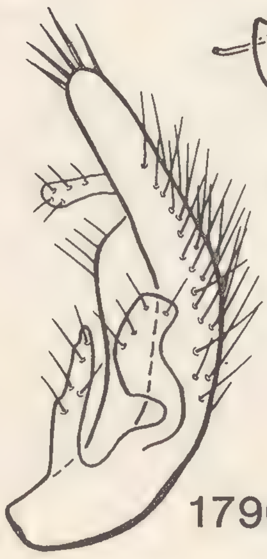
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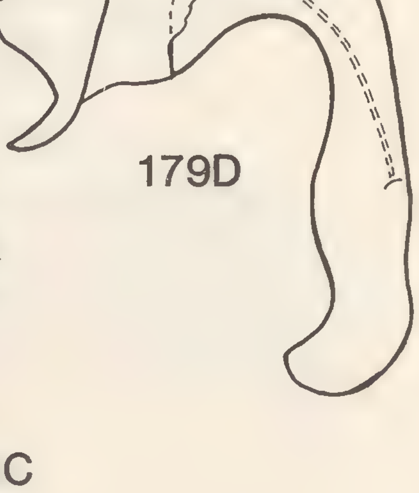
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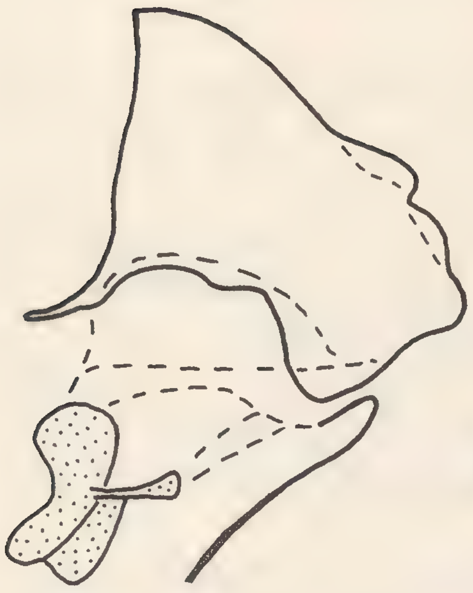

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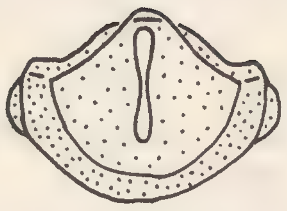
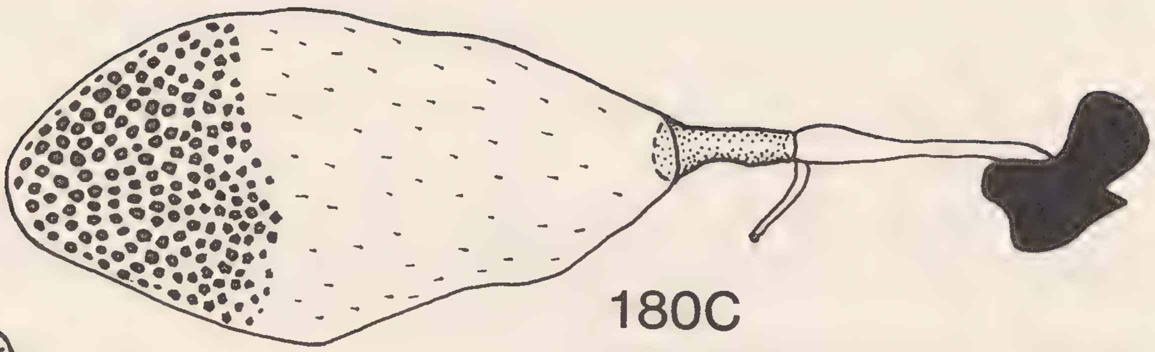


180B



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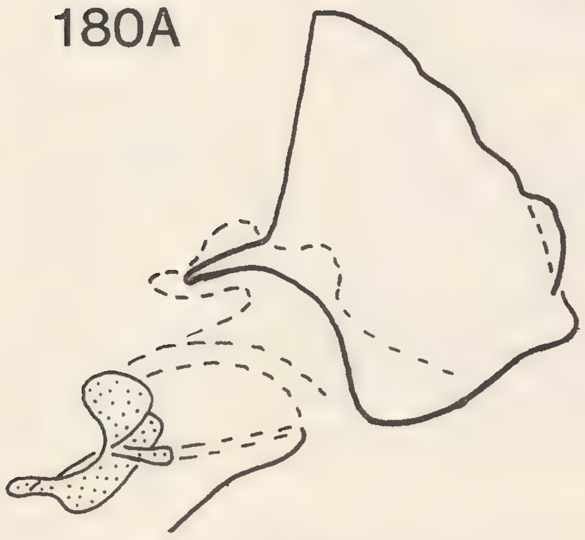
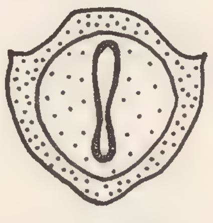
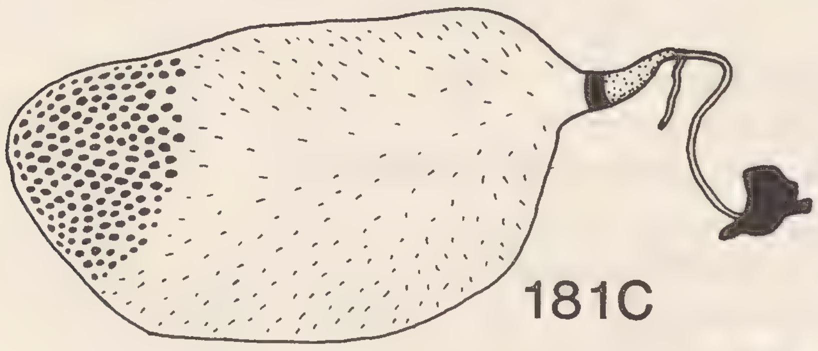


181A



181B



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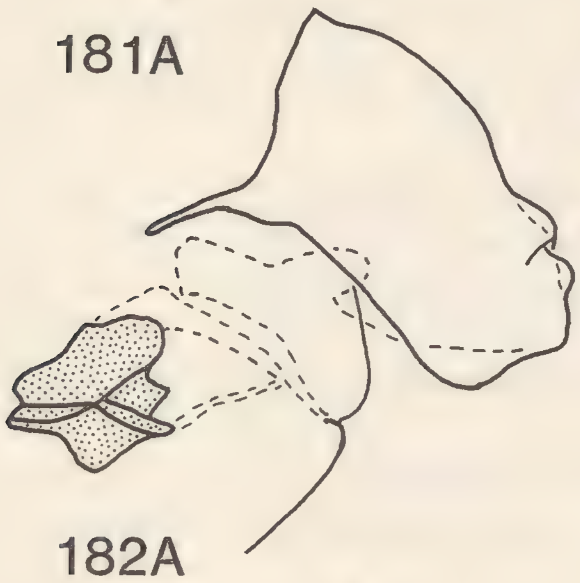
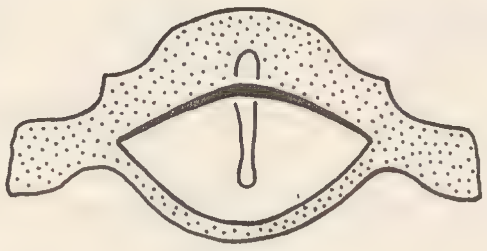
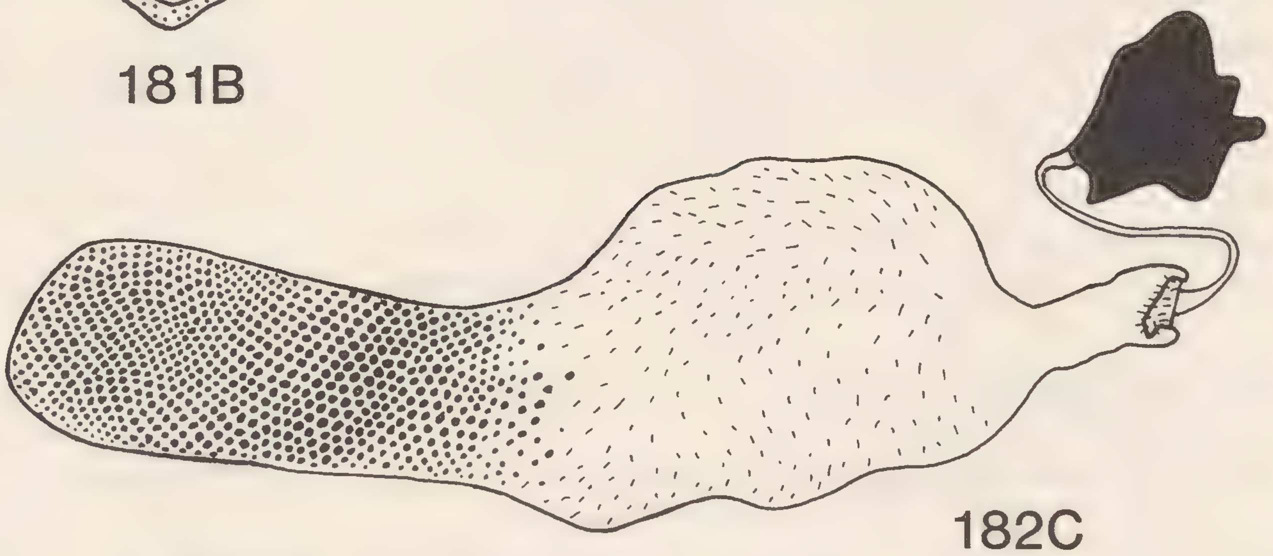


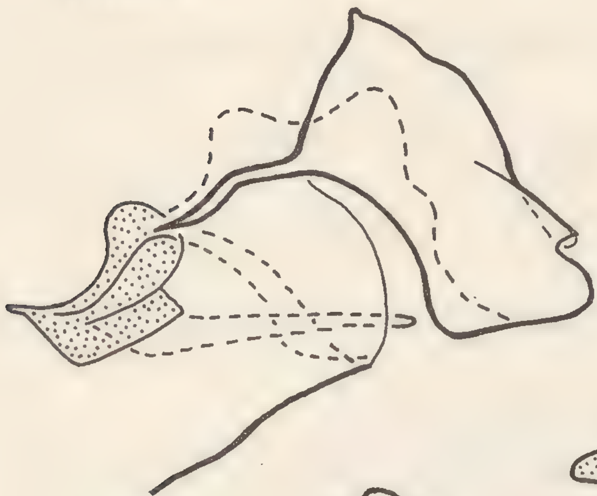
182A



182B



182C



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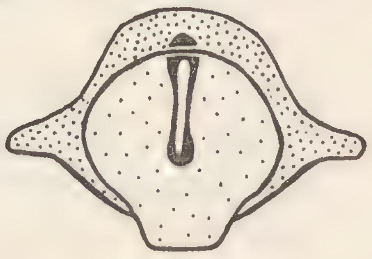
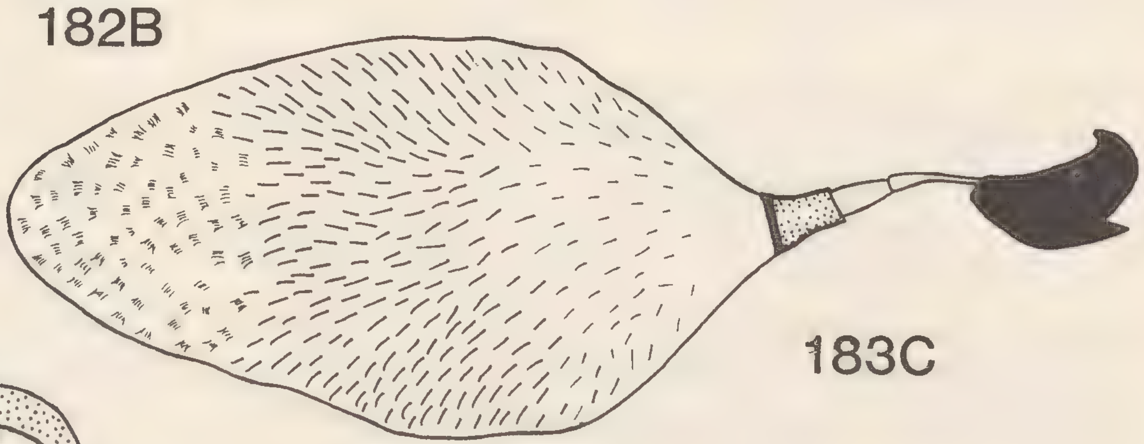
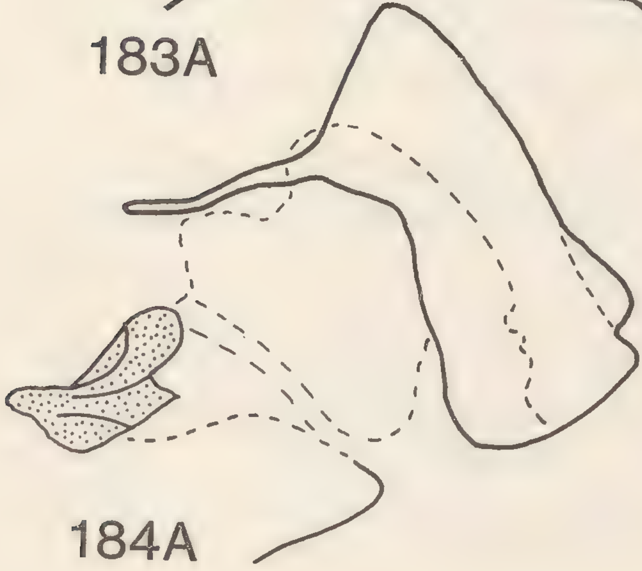


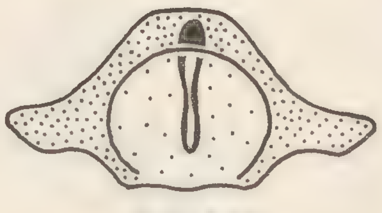
183B



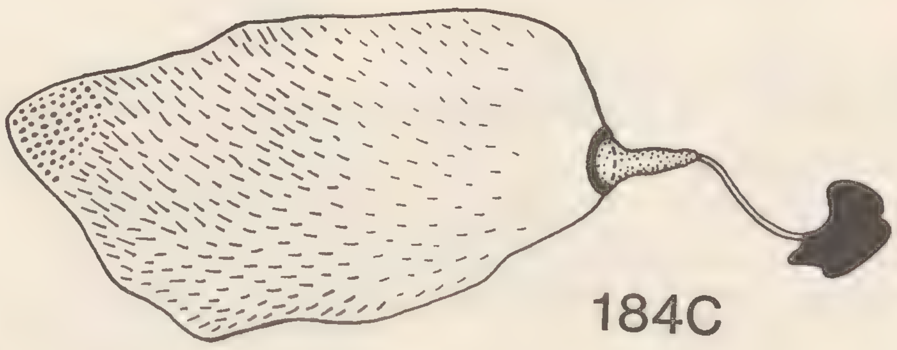
183C



184A



184B



184C

INDEX

Valid names are in roman type, with principal references in bold. Synonyms, preoccupied names, and epithets of inappropriate gender are in italics.

acarola, Lepidostoma 47
acarolum, Lepidostoma (Nosopus) 8, 17, 23, 46, **47**, 51
Alepomyia 19
Alepomyiodes 19
alexanderi, Lepidostoma 51
americana, Lepidostoma 28
americana, Olemira 19, 28, 29
americanum, Lepidostoma (Nosopus) 1, 21, **28**, 29, 30, 31, 38, 40, 42, 43
americanum group, Lepidostoma (Nosopus) 18, 19, 21, **28**
Annulipalpia 9
Aopsyche 10
aporna, Lepidostoma 79
apornum, Lepidostoma (Neodinarthrum) 76, **79**, 83
Arcadopsyche 19
astanea, Lepidostoma 25
astaneum, Lepidostoma (Nosopus) 1, 21, **25**, 26
astaneum group, Lepidostoma (Nosopus) 17, 19, 20, **25**
Atomyia 19
Atomyiodes 3, 15, 19
aztecum, Lepidostoma (Nosopus) 24, 46, **47**, 50, 52

bakeri, Lepidostoma (Nosopus) 17, 22, **40**, 41, 44, 45, 47, 60
basalis, Lasiocephala 6
baxea, Lepidostoma (Neodinarthrum) 76, **77**, 78
bispinosa, Atomyiodes 19, 51
bispinosa, Lepidostoma 51
bispinosus, Atomyiodes 19, 51
bryanti, Alepomyia 19, 29
bryanti, Lepidostoma (Nosopus) 21, 28, **29**, 31, 40, 50

calense, Lepidostoma 1
calensis, Lepidostoma 26
Calocidae 4
canadensis, Pristosilo 16, 90, 91
cantha, Lepidostoma 77
canthum, Lepidostoma (Neodinarthrum) 76, 77
canthum group, Lepidostoma (Neodinarthrum) 8, 75, **76**
carolina, Lepidostoma (L.) 84, **85**, 86, 87
carolina, Notiopsyche 16, 85
carrolli, Lepidostoma (Mormomyia) 62, **65**, 67
cascadense, Lepidostoma (Nosopus) 1, 6, 17, 20, 33, 56, **57**
cascadensis, Jenortha 19, 57, 58
cascadensis, Lepidostoma 57
cinereum, Lepidostoma (Nosopus) 1, 16, 18, 19, 22, 40, **41**, 44
cinereus, Silo 41, 42
compressa, Lepidostoma 36
compressum, Lepidostoma (Nosopus) 22, 35, **36**, 37, 39
corona, Theliopsyche 8, 10, 11, **12**, 13, 14
costale, Lepidostoma (Nosopus) 21, 28, **30**, 31
costalis, Lepidostoma 30
costalis, Olemira 30
crassicornis, Neoseverinia 6
crypta, Lepidostoma 83, 84
cryptum, Lepidostoma 1, 84

dafila, Lepidostoma (Nosopus) 23, 46, **48**
deceptiva, Thremma 60
deceptivum, Lepidostoma (Nosopus) 1, 16, **60**
delongi, Lepidostoma (Nosopus) 23, 46, **48**, 52
denningi, Lepidostoma (Nosopus) 1, 24, 46, **49**, 52, 53
Dinarthrella 54
Dinarthrodes 6
Dinarthrum 6, 75

epilone, Theliopsyche 12
epilonis, Theliopsyche 11, **12**, 14
Eremopsyche 3, 19
ermanae, Lepidostoma (Nosopus) 1, 6, 17, 20, 54, **55**
errigena, Lepidostoma 79
errigenum, Lepidostoma (Neodinarthrum) 76, **79**, 83
etnieri, Lepidostoma (Mormomyia) 1, 62, 65, **67**
excavatum, Lepidostoma (Mormomyia) 16, 62, **67**, 68, 74

fischeri, Lepidostoma 1, 83, 84

flinti, Lepidostoma (Mormomyia) 62, **70**, 71, 72, 73, 74
Flura 16
frontale, Lepidostoma (Nosopus) 23, 46, **49**, 51
frontalis, Eremopsyche 19, 49
frontalis, Lepidostoma 49
frosti, Atomyia 43
frosti, Lepidostoma (Nosopus) 17, 22, 40, 41, **43**, 45

glenni, Lepidostoma (Mormomyia) 62, 70, **71**
goedeni, Lepidostoma 1, 25
Goerodes 3
gracilicornis, Mormonea 15
grisea, Lepidostoma 63
grisea, Phanopsyche 60, 63
grisea, Theliopsyche 9, 11, **13**, 14, 15
griseum, Lepidostoma (Mormomyia) 6, 29, 60, 61, **63**, 64, 65, 66, 68, 70, 71, 74
griseum group, Lepidostoma (Mormomyia) 60, 61, **63**
griseus, Silo 10, 13

heveli, Lepidostoma (Nosopus) 23, 48, **49**, 53
hirta, Phryganea 15
hirtum, Lepidostoma (L.) 4, 5, 84, 90
hoodi, Lepidostoma (Nosopus) 6, 17, 20, 54, 55, **56**, 57
hoodi group, Lepidostoma (Nosopus) 5, 17, 20, **54**

iranicum, Dinarthrum 6
irrorata, Crunoecia 5

Jenortha 19
jewetti, Lepidostoma (Nosopus) 4, 19, 21, 26, **27**
jewetti group, Lepidostoma (Nosopus) 18, 19, 21, **26**, 28

knowltoni, Lepidostoma 1, 88
knulli, Lepidostoma (Nosopus) 17, 22, 40, 41, **44**, 45, 60

lacinatum, Lepidostoma (Nosopus) 23, 46, 47, 49, **50**, 51, 53, 54
latipenne, Lepidostoma (L.) 6, 84, 85, **86**
latipennis, Lepidostoma 86
latipennis, Notiopsyche 16, 86, 87
leechi, Lepidostoma 44
leonilae, Lepidostoma (Nosopus) 24, 46, **50**
Lepidostoma 1, 2, 3, 4, 5, 7, 8, 9, 10, **15**, 16, 18, 19, 60, 75, 84
Lepidostoma (subgenus) 1, 2, 8, 9, 18, **84**, 85
Lepidostomatidae 1, 2, **3**, 10
Lepidostomatinae 3
liba, Lepidostoma 68
libum, Lepidostoma (Mormomyia) 16, 63, 67, **68**, 69
libum group, Lepidostoma (Mormomyia) 5, 16, 61, 62, **67**, 73
licola, Lepidostoma 27
licolum, Lepidostoma (Nosopus) 21, 26, **27**
lobatum, Lepidostoma (Mormomyia) 62, **73**, 74
lotor, Lepidostoma (Neodinarthrum) 76, **80**
lydia, Lepidostoma (Nosopus) 22, 35, **36**, 37, 38

melas, Theliopsyche 10, 11, **14**
mexicana, Lepidostoma 51
mexicana, Olemira 19, 51
mexicanum, Lepidostoma (Nosopus) 17, 23, 46, 47, 49, 50, **51**, 53
mexicanum group, Lepidostoma (Nosopus) 5, 17, 19, 22, 23, **46**
Micrasema 5
mira, Lepidostoma 57, 58
mirum, Lepidostoma 1
mitchelli, Lepidostoma (Mormomyia) 62, 67, 69, 73, **74**
mitchelli group, Lepidostoma (Mormomyia) 62, **73**
modesta, Atomyia 19, 37
modestum, Lepidostoma (Nosopus) 22, 35, 36, **37**, 38, 39, 44, 47
modestum group, Lepidostoma (Nosopus) 6, 9, 18, 19, 21, **35**, 40
moneka, Lepidostoma 80, 81
monekum, Lepidostoma 1, 80, 81
Mormomyia (subgenus) 1, 2, 5, 8, 9, 16, 18, 19, **60**, 61, 75
Mormonia 15
morsei, Lepidostoma (Mormomyia) 1, 61, 63, **64**

Neodinarthrum (subgenus) 1, 2, 5, 8, 9, 16, 18, **75**, 76
Neuropsyche 16
Nosopus (subgenus) 1, 2, 4, 5, 6, 8, 9, 18, **19**, 20, 61, 75
Notiopsyche 16

oaxacense, Lepidostoma (Nosopus) 23, 46, **52**
oaxacensis, Lepidostoma 52

Oeconesidae 4
Olemira 19
Oligopsyche 16
ontario, Lepidostoma (Nosopus) 22, 35, 36, **37**
ormea, Lepidostoma 80
ormeum, Lepidostoma (Neodinarthrum) 1, 76, **80**, 81, 83

pallidus, Silo 90, 91
Paradinarthrodes 3
parva, Theliopsyche 10, 12, 13, **14**
Phanopsyche 60
pictile, Lepidostoma (Nosopus) 1, 22, 35, 36, **38**, 39
pictilis, Mormonia 28, 38, 39
pilosa, Goera 5
pleca, Lepidostoma 57, 58
pluviale, Lepidostoma (Neodinarthrum) 1, 75, 76, 77, 78, 79, 80, **81**, 83
pluviale group, Lepidostoma (Neodinarthrum) 75, 76, **78**
pluvialis, Olemira 75, 81, 82
podager, Lepidostoma 31
podager, Nosopus 19, 31
podagrum, Lepidostoma (Nosopus) 4, 6, 21, 28, 29, **31**, 33
podagrum group, Lepidostoma (Nosopus) 18, 21, **31**, 35
Pristosilo 16
prominens, Arcadopsyche 19, 31
prominens, Lepidostoma (Nosopus) 21, 28, 30, **31**

quercina, Lepidostoma 33
quercinum, Lepidostoma (Nosopus) 4, 21, 31, 32, **33**
querla, Lepidostoma 80, 81
querlum, Lepidostoma 1, 80, 81
quila, Lepidostoma (Nosopus) 24, 46, **52**
Quisilo 10

rayneri, Lepidostoma (Neodinarthrum) 1, 76, 79, **83**
recina, Lepidostoma 26
recinum, Lepidostoma (Nosopus) 1, 21, 25, **26**
rectangulare, Lepidostoma (Nosopus) 24, 46, 49, **53**
reimoseri, Lepidostoma (Nosopus) 24, 46, 50, **53**
reosa, Lepidostoma 24
reosum, Lepidostoma (Nosopus) 16, 19, 20, **24**
reosum group, Lepidostoma (Nosopus) 16, 19, **24**
rhino, Lepidostoma 1, 81, 82
rileyi, Lepidostoma 89
roafi, Atomyia 34
roafi, Lepidostoma (Nosopus) 23, 33, **34**, 48, 58, 59
roafi group, Lepidostoma (Nosopus) 18, 22, **33**
roemhildi, Lepidostoma 1, 56, 57

sackeni, Lepidostoma (Mormomyia) 61, 63, 70, **71**
sackeni, Mormomyia 71, 72
Sericostomatidae 1, 3
serratum, Lepidostoma (Mormomyia) 62, 65, **66**
serratum group, Lepidostoma (Mormomyia) **65**
sommermanae, Lepidostoma (Mormomyia) 16, 63, 67, 68, **69**
spicata, Lepidostoma 56, 57
spicatum, Lepidostoma (Nosopus) 1, 6, 17, 20, 54, 55, **56**
squamulosum, Lepidostoma 15
steinhauseri, Lepidostoma (Nosopus) 23, 46, 49, **53**
stigma, Lepidostoma (L.) 1, 84, 85, **88**, 89, 90
strophe, Lepidostoma 1, 41
strophis, Lepidostoma 41, 42
stylifer, Lepidostoma 74
styliferum, Lepidostoma (Mormomyia) 62, 73, **74**
swannanoa, Lepidostoma 1, 38, 39

talamancense, Lepidostoma (Nosopus) 17, 24, 46, 52, **54**
tallapoosa, Theliopsyche 9, 11, 13, **15**
Tasimiidae 3
Theliopsyche 1, 3, 4, 5, 7, 8, 9, **10**, 11, 24
tibiale, Lepidostoma (L.) 84, 85, **89**
tibialis, Lepidostoma 89
tibialis, Neuropsyche 16, 89
togata, Mormomyia 15, 90, 91
togatum, Goerodes 90
togatum, Lepidostoma (L.) 4, 84, 85, 88, 89, **90**
Trichovespula 3

unicolor, Lepidostoma (Nosopus) 8, 18, 19, 22, 33, 34, 40, 43, **44**, 47, 48, 59
unicolor, Mormomyia 44, 45
unicolor group, Lepidostoma (Nosopus) 6, 17, 22, 28, 37, **40**, 46

veleda, Lepidostoma 81, 82
veledum, Lepidostoma 1, 81, 82

vernale, Lepidostoma (Mormomyia) 8, 62, 63, 65, 66, 67, 68, 69, 70, 71, **72**, 73, 74
vernale group, Lepidostoma (Mormomyia) 61, 62, **70**, 73
vernalis, Lepidostoma 72
vernalis, Mormonia 60, 72
vernalis group 15, 60
veroda, Lepidostoma 59
verodum, Lepidostoma (Nosopus) 5, 6, 17, 20, 34, **59**

weaveri, Lepidostoma (Nosopus) 22, 35, 36, **39**
wisconsinense, Lepidostoma 29
wisconsinensis, Lepidostoma 19, 29

Yamatopsyche 3